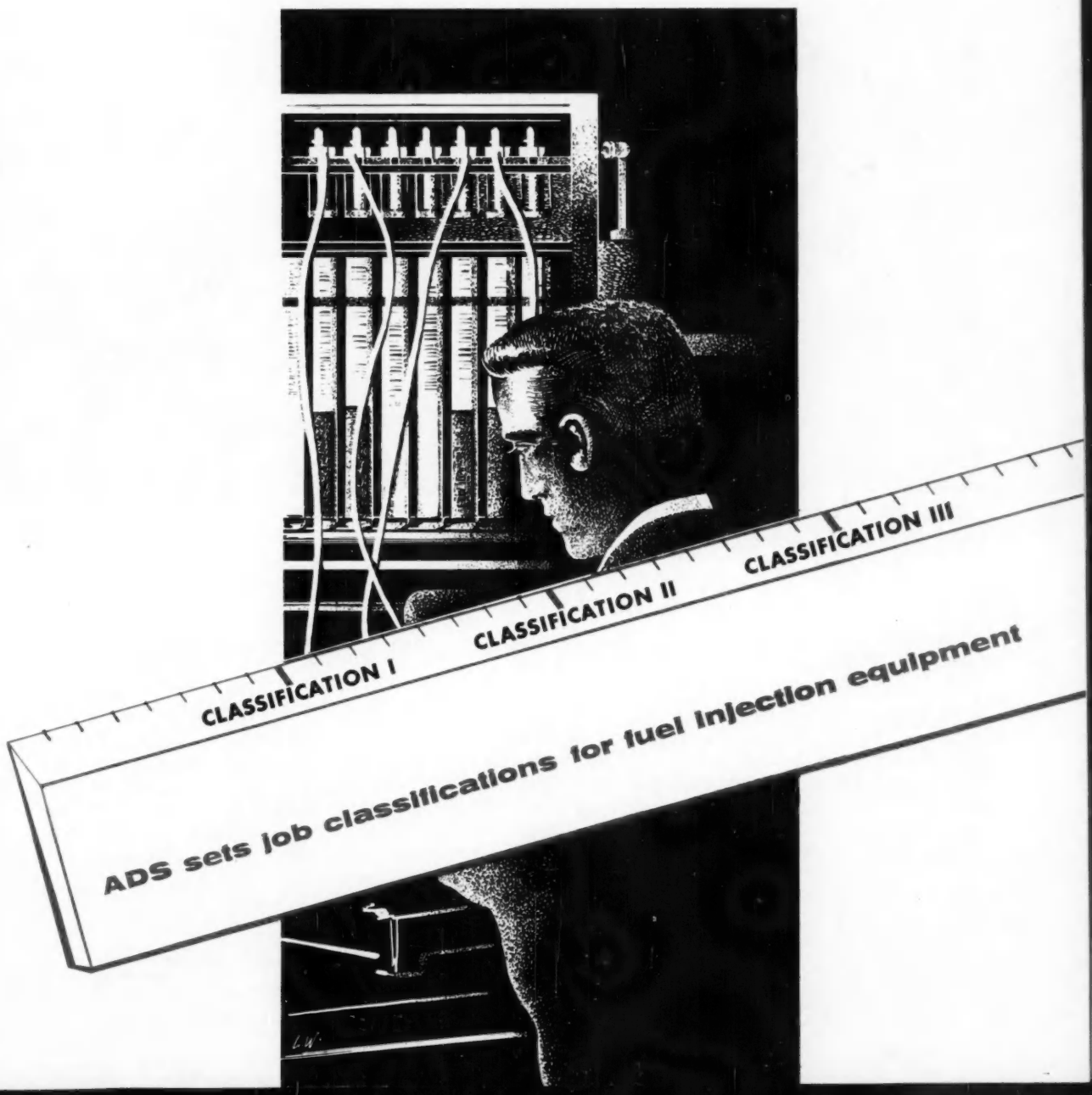
diesel power

February 1961

oem dp es

geared to the needs of original equipment manufacturers
and equipment superintendents in the field



ADS sets job classifications for fuel injection equipment

R. L. Boyer, *Vice President and Director of Engineering, and* W. B. Boyum, *Manager of Gas Turbine Sales, The Cooper-Bessemer Corporation report...*

World's first jet powered gas turbine is now on the job

You are looking at a revolutionary new concept in industrial power. This Cooper-Bessemer 10,500 hp RT-248 gas turbine with a modified Pratt & Whitney Aircraft J-57 jet engine introduces new, drastic economies in plant construction, operation and maintenance. Shown here on the job at the Clementsville (Kentucky) Compressor Station of Columbia Gulf Transmission Company, this powerful, compact unit has taken on the total gas-boosting load of the station, operating 'round the clock. Find out how this outstanding joint development of Cooper-Bessemer and Pratt & Whitney Aircraft can fit into *your* plans for compressors, generators and other rotating machinery. Call our nearest office.

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ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE, TURBINE OR MOTOR DRIVEN

For more information write in No. 460

BENDIX BROADENS ITS DIESEL FUEL INJECTION CAPABILITIES WITH ADDITION OF SIMMS LINE

Through a recent agreement with Simms Motor Units, Ltd. of London, England, Bendix will market and manufacture Simms fuel injection equipment for diesel engines in the United States. Thus, diesel engine manufacturers and users will benefit through an extremely wide range of equipment for their fuel injection needs.

Equipment manufactured by Scintilla Division of Bendix today is serving the fuel injection needs of leading U. S. diesel builders, particularly in the high-horsepower class. Now, with the addition of the Simms equipment, Bendix can offer multi-cylinder pump units adaptable to small- and medium-sized engines. Simms equips many makes of British diesels, as well as Ford diesel-powered farm tractors built in this country.

The nation-wide organization of Bendix® fuel injection equipment distributors and service dealers will perform equivalent functions on the Simms units, with prompt deliveries and efficient service. For details, write:

Scintilla Division
Sidney, New York

THE Bendix CORPORATION

Export Sales & Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

For more information write in No. 461

GET REAL PRODUCTIVITY—GET A GM DIESEL

Want to see the difference in Diesels? Put one in a quarry operation on a stepped-up production schedule, let it work 50 hours a week for a solid 10 months surrounded by abrasive rock dust—then check your books to see how it stood up.

That's what Mantorville, Minnesota's Stussy Construction Co. did with their first GM Diesel several years ago. The company now has nine GM Diesels powering loading cranes, a Joy compressor, Koehring Dumptor and a Cedarapids rock crushing plant. And Partner Don Stussy says, "Eventually we'll go all General Motors Diesel engines because of the savings available to us in parts as compared to other Diesels."

Don reports parts and service average about $95 per season on each engine with several years' usage—says that's a pretty good bargain "when you figure that's *total cost* for keeping each engine running day in and day out on stepped-up production a good deal of the time." He's looked at other makes—says if he switched "we'd be faced with hard starting and more frequent overhauls. We'd be upping our service repair costs at least 25% with other Diesels just figurin' on the difference between cost of parts alone."

If you've got an "engine killing" operation, you'll find it's just the job for a "Jimmy." Want to know more? Call your GM Diesel distributor—he's in the Yellow Pages under "Engines, Diesel"—or write direct.

GM DIESEL

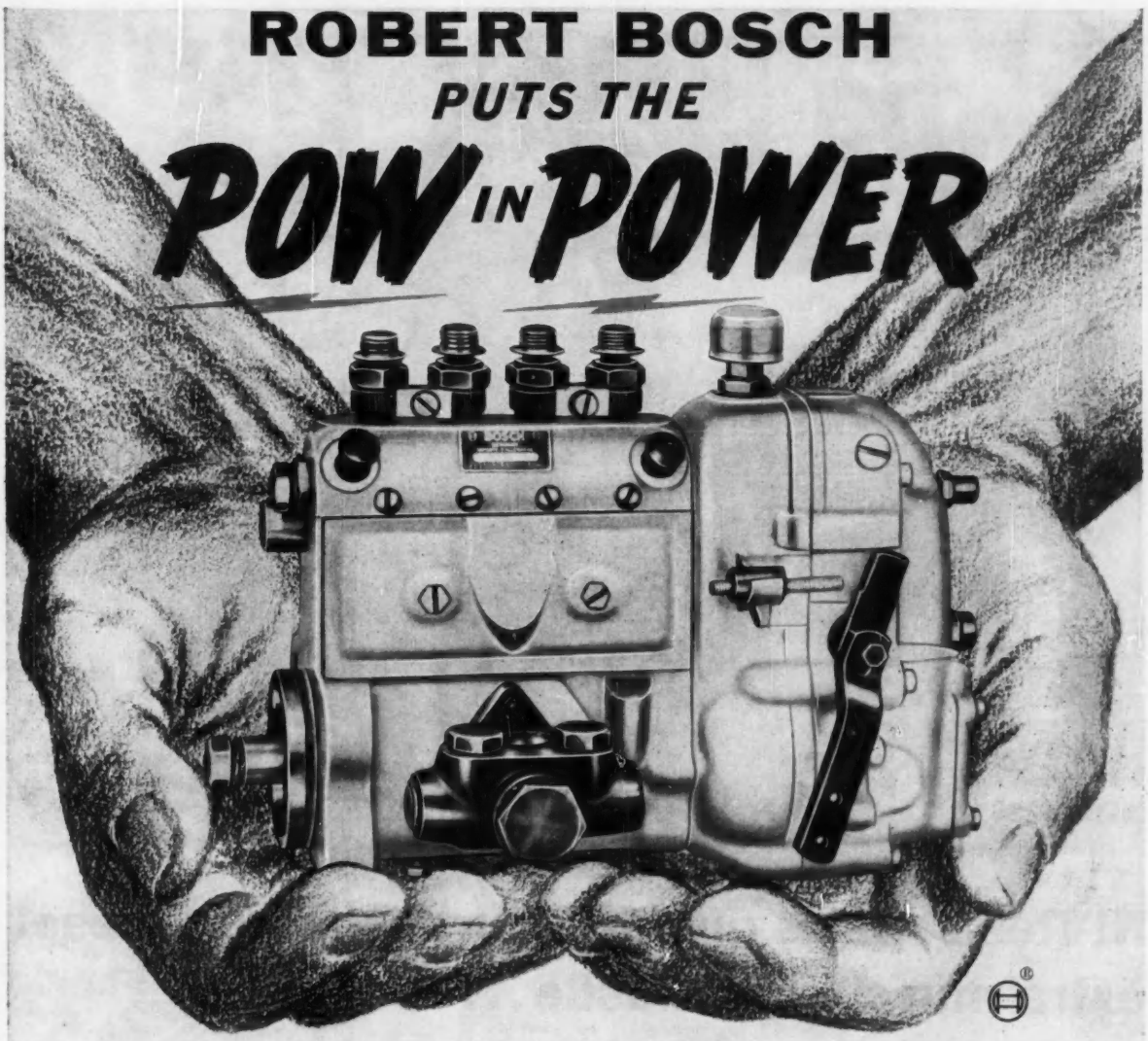
DETROIT DIESEL ENGINE DIVISION,
GENERAL MOTORS, DETROIT 28, MICH.

In Canada GENERAL MOTORS DIESEL LIMITED, London, Ontario
Parts and Service Worldwide

GM DIESEL ALL-PURPOSE POWER LINE sets the standard of Diesel productivity

For more information write in No. 462

ROBERT BOSCH
PUTS THE
POW IN POWER



— in the world's finest Fuel Injection Equipment

ROBERT BOSCH means fuel injection equipment made to the closest tolerances. It means over 30 years of experience by the designers of the fuel injection equipment which made the high speed diesel engine practicable. It means fuel injection equipment of consistently higher quality at lower price... most complete line of nozzles... world-wide service. Leading engine makers here and abroad use ROBERT BOSCH as original equipment.

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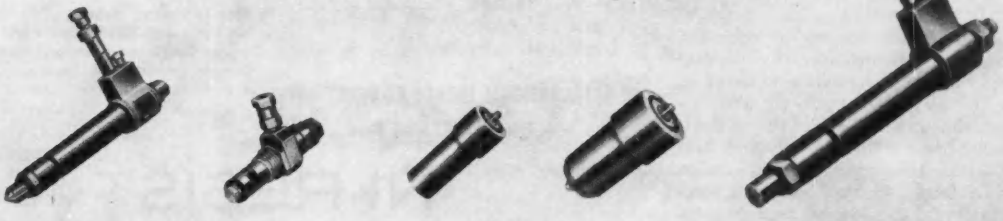


For more information write in No. 463

Ni-Resist parts give this turbocharged diesel extra muscle and hustle... with lower operating costs

This LeTourneau-Westinghouse Haulpak® can highball a 32-ton load across open country at 39 mph. And it can deliver this kind of performance dependably, day after day, under the most rugged working conditions.

Ni-Resist* parts contribute to dependability. One reason for the Haulpak's dependable performance is the use of Ni-Resist nickel-alloyed austenitic cast iron in its 380 hp Cummins Turbodiesel** engine.

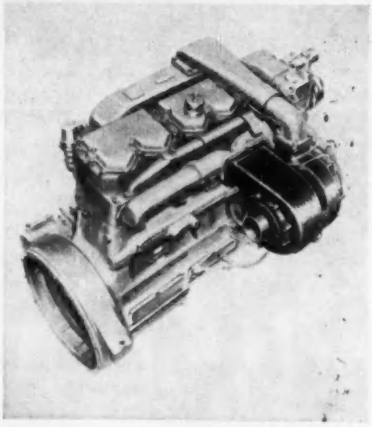
The *turbocharger casing*, for example, is made of Ni-Resist iron to withstand the hot exhaust gases that tend to crack, warp or scale ordinary irons. The Ni-Resist iron *exhaust manifold* is field-proven to last the life of the engine. And the Ni-Resist iron *piston ring inserts* stand up longer to high operating temperatures and the rugged pounding inside this high-compression engine.

Ni-Resist engine parts cut operating costs. Ni-Resist iron has a superior ability to hold up under the high operating temperatures in turbocharged engines. That is why Cummins uses Ni-Resist irons for so many critical parts in the Turbodiesel.

If you build or use heavy-duty diesel engines, you'll do well to specify Ni-Resist irons for such parts as turbocharger casings, exhaust manifolds and piston ring inserts. For more detailed information, write to:

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.



Note compact design of the Haulpak's 380 hp Cummins Turbodiesel engine. Ni-Resist parts help save weight and space—last longer because of superior strength and resistance to heat.

®Registered trademark, LeTourneau Westinghouse Co.
*Registered Inco trademark
**Registered trademark, Cummins Engine Company, Inc.

NI-RESIST

NICKEL-ALLOYED IRONS PERFORM BETTER LONGER

For more information write in No. 464

diesel power

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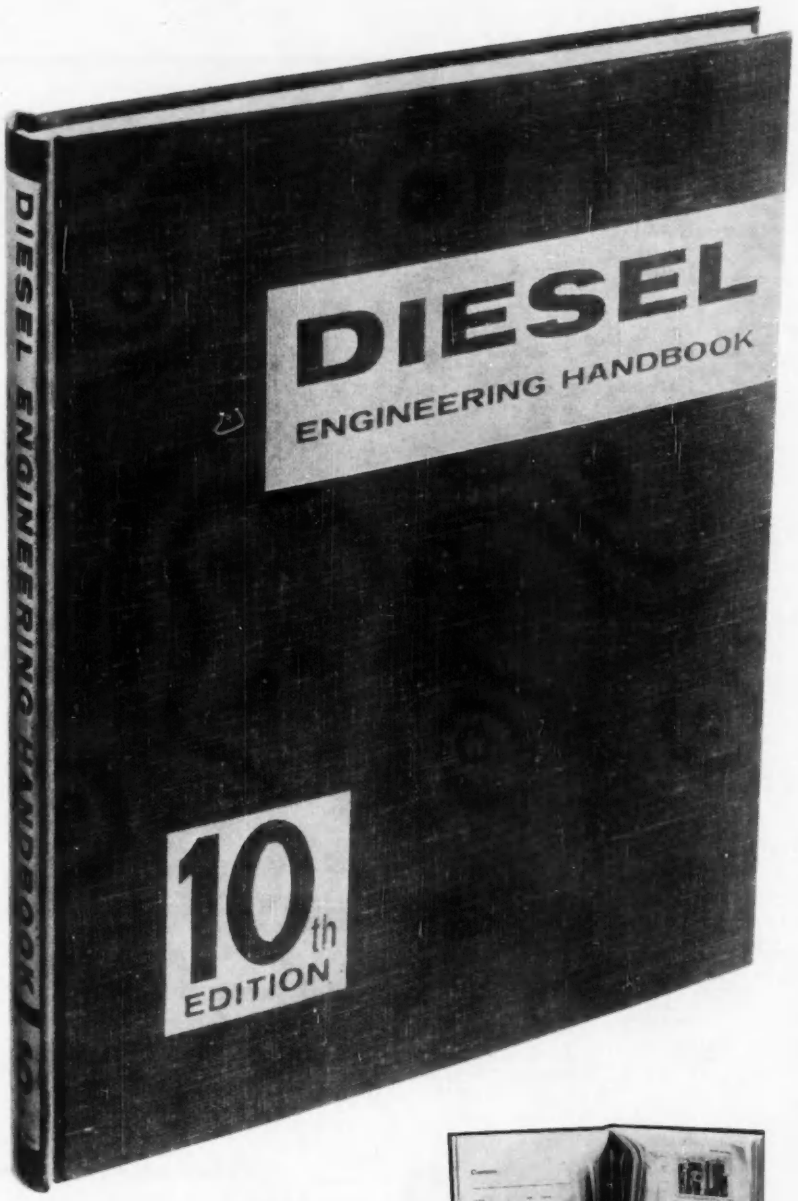

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NEW FRAM *WEAR-GUARD* FILTERS PROVED GREATEST ADVANCE IN ENGINE PROTECTION SINCE DETERGENT OILS!

Tests show new *Wear-Guard* construction traps up to 40% more dirt than any other filter tested! It guards engines against unnecessary wear... stops fuel waste!

The secret is in the construction! Thousands of tiny filter pockets are packed inside new Fram *Wear-Guard* Filters with new pleated fiber. Tests – including radioactive tracer techniques – prove Fram Oil and Air Filters with *Wear-Guard* will keep engines far safer than any other filters tested.

Why risk excessive engine wear and poor engine performance? Install new Fram *Wear-Guard* Filters – the most advanced filter protection for any engine made.

FRAM CORPORATION, PROVIDENCE 16, R.I.

YOUR FIRST LINE OF ENGINE PROTECTION

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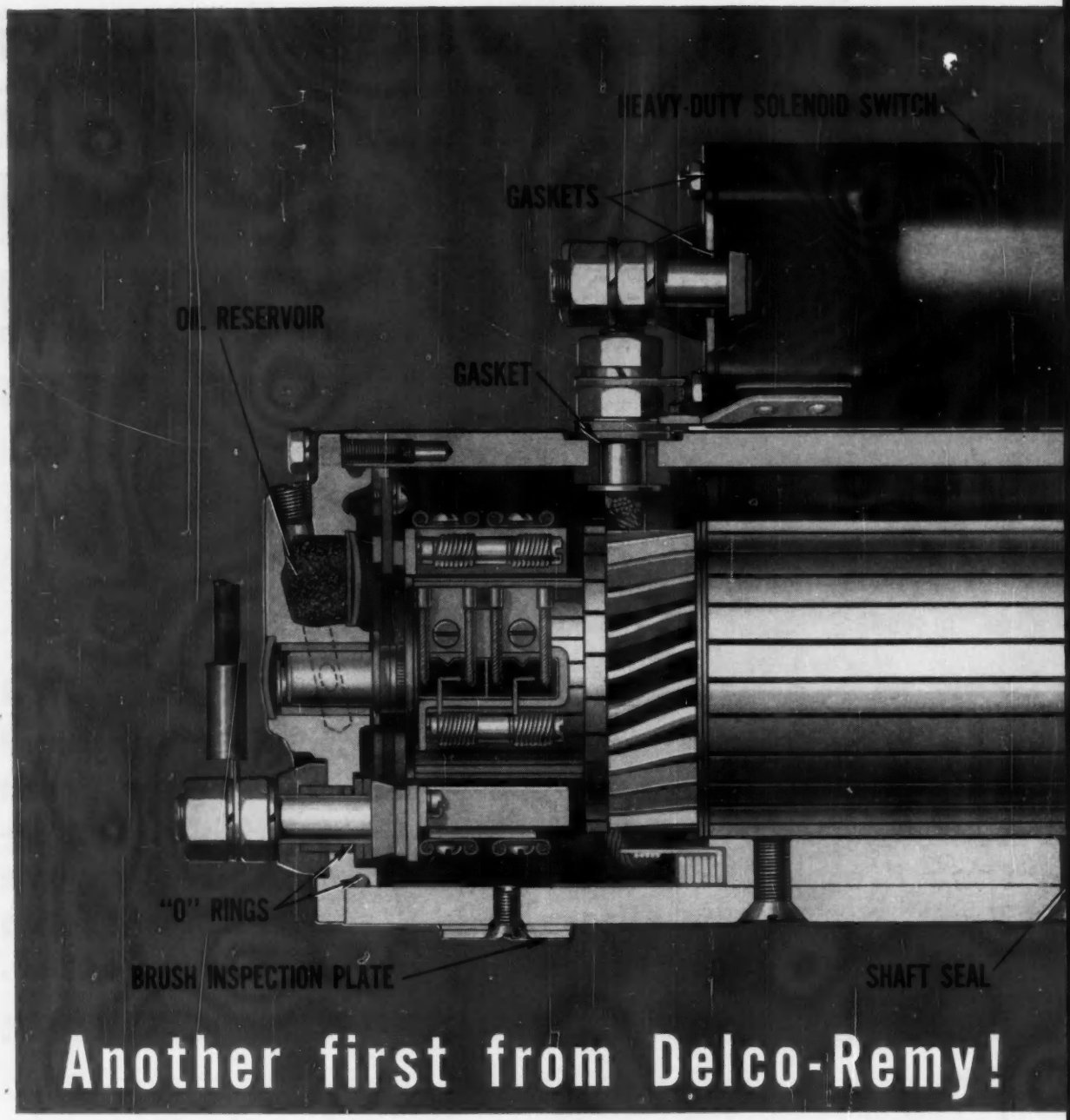
OIL AIR FUEL WATER
FILTERS



Another first from Delco-Remy!

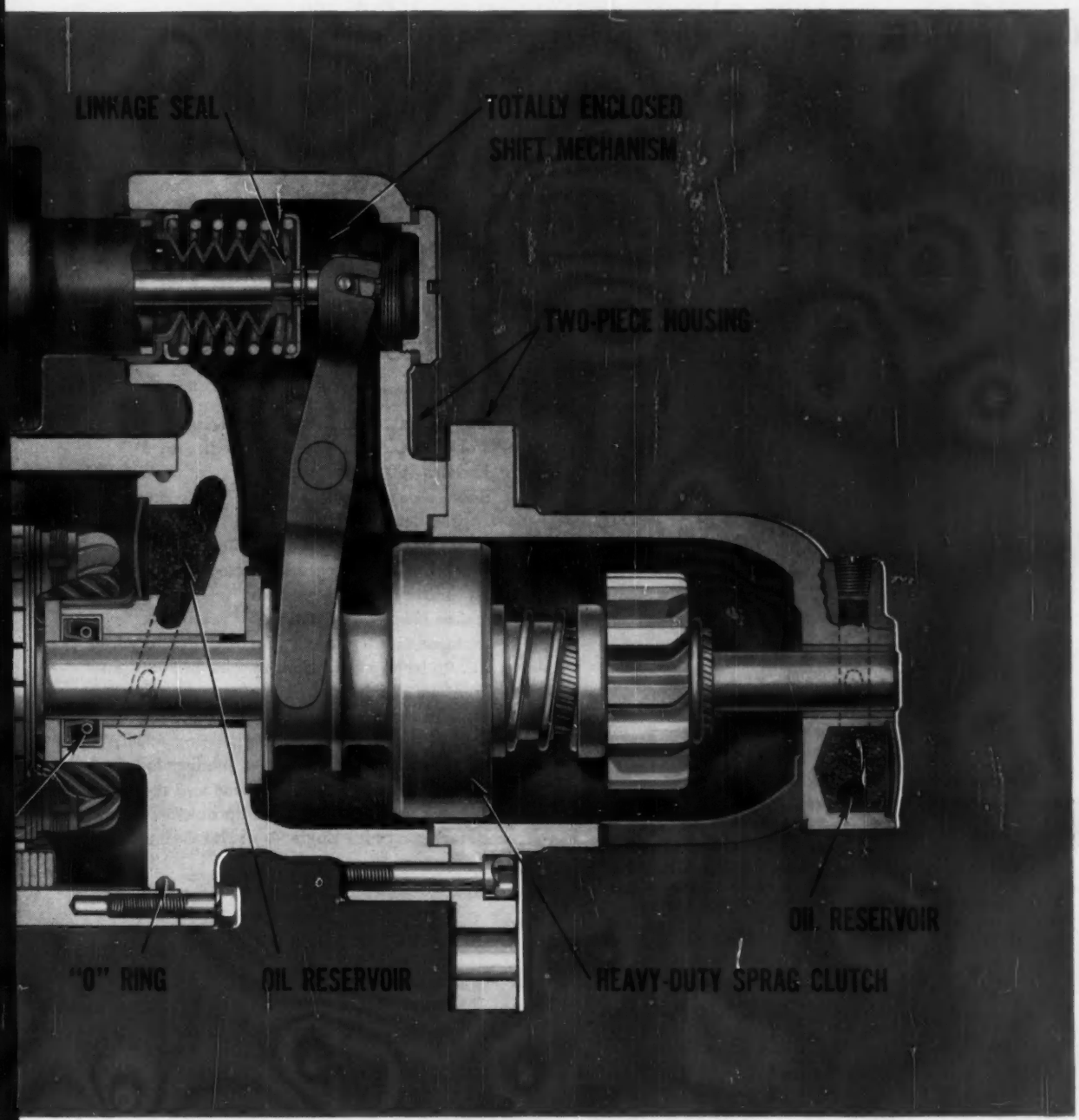
NEW DELCO-REMY HIGH-OUTPUT MOTOR

Completely new series of high-output cranking motors! These 12-volt motors have the torque and speed to do the same job as 24-volt motors of equal size *and on the same battery power.* No need for series-parallel switches and their complicated wiring on engines up to 900 cubic inches. These solenoid-operated, over-running clutch type heavy-duty cranking motors come with special two-piece drive housings that permit 24 different motor mounting positions. Their new 50% longer brushes, together with sealing rings (optional) and large oil reservoirs (optional), assure extra-long operating time between overhauls.

TOTALLY ENCLOSED DRIVE SHIFTING MECHANISM is protected against dirt, water, slush and ice. This enclosure, plus the shaft seal and linkage seal, also blocks transmission oil leakage into the motor and solenoid.

TWO-PIECE DRIVE HOUSING DESIGN permits 24 different solenoid positions which allows greater standardization—cuts fleet inventories. Nose housings are available in S.A.E. #2 and #3 mountings.

HEAVY-DUTY SOLENOID AND SWITCH provide positive pinion engagement and safely handle maximum starting current. Special seals keep out foreign material and allow increased contact life.



ELIMINATES SERIES-PARALLEL SWITCHES

SPRAG CLUTCH DRIVE operates with non-chamfered ring gear. Pinion indexes on spiral spline, positively engaging ring gear before power is switched on. Engagement of the pinion and ring gear is maintained during intermittent or sporadic engine firing.

HEAVY BRUSH INSPECTION PLATES resist damage from use and handling—are sealed to prevent leakage.

Engine manufacturers are invited to write directly to Delco-Remy for complete information and engineering assistance on the specific application of these new motors.

Fleet owners should specify this motor for new trucks through their truck dealers.

FROM THE HIGHWAY TO THE STARS

Delco-Remy
electrical systems

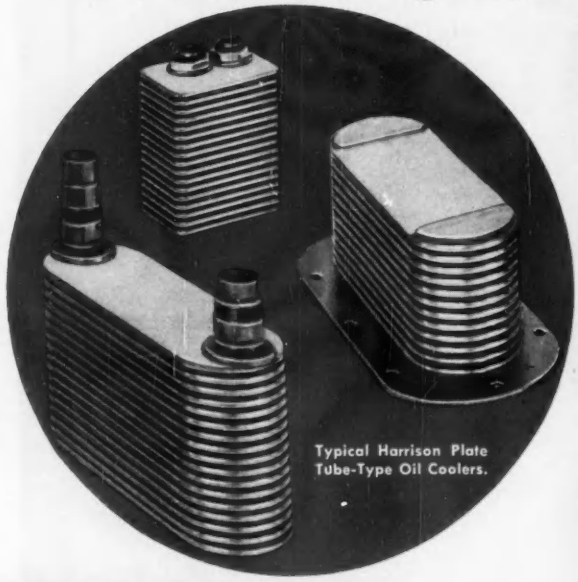
GM GENERAL MOTORS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, IND.

For more information write in No. 466

General Motors Reliability in Action...

HOT JOB...RUNS COOL WITH GM HARRISON



Typical Harrison Plate Tube-Type Oil Coolers.

Designed to mount in the bottom tank of conventional type radiators, this Harrison Oil Cooler is another reliable product of General Motors Research and Engineering.

HARRISON OIL COOLERS PROVE METTLE IN HOT-METAL OPERATION!

Taking on the hot job is a Harrison specialty. For example, this diesel-powered shovel handles 700°F slag in a Gary steel mill 24 hours a day, seven days a week. To meet this rugged demand, Harrison Oil Coolers—with built-in reliability—are specified. We call this reliability . . . "measurable excellence." It's an "initial design to end use" concept which makes Harrison heat transfer products perform as intended . . . for the time required . . . under the conditions specified. You'll find Harrison reliability in 15 basic types of heat transfer construction . . . a complete line of designs that permits the engineering selectivity that assures the *right* heat exchanger for every application. To save time and money on your temperature control problems, call in a Harrison Sales Engineer at the design stage.

Free For an informative 48-page brochure on the complete Harrison line . . . write to Department 902.

GM HARRISON

TEMPERATURES MADE TO ORDER

AIRCRAFT, AUTOMOTIVE, MARINE AND INDUSTRIAL HEAT EXCHANGERS

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

For more information write in No. 467

diesel power

editorially speaking

Our "State of the Industry" Message

How do you measure the state of an industry? Annual production figures? But this is like reading a speedometer . . . it only tells what's happening right now—no past or future performance. Figures of past years let you plot a curve but in projecting, which way should the curve go? You must look for other yardsticks. One is the extent of research and development going on. This impresses us. Much information received was "privileged" as the lawyers would say, so we can't be specific. However, we know of more new engines in various developmental stages than at any other time we can recall. Several new ones are already in production . . . take the new crop of farm tractor diesels. Applications envisioned for the new engines range from vehicular use to truck and rail refrigeration and general industrial use. Another yardstick is the new blood in diesel manufacture. For example, three truck builders who never before built diesels have engines in or ready for production. Also, look at the farm tractor boys now building their own diesels whereas they used to buy them. Another yardstick, look at expansion in parts and service facilities. This broadening base is the key to expanded diesel usage. Take one case . . . Diesel Injection Sales & Service in Norfolk, Va. Just saw their smart new building with 28,000 sq ft of floor space. Facilities are complete, up-to-date even to IBM machines for parts inventory and control, general office services. With four branches serving Virginia and North Carolina, this firm is an example of how far fuel injection and governor repair shops have progressed just since World War II. Though there has been expansion into other areas of diesel sales and service, fuel injection systems are still the focal point of the business. So today we have intensive development, new blood and expanded service facilities in the diesel industry. This effort and investment by foresighted business men is good indication that they expect broad expansion for the diesel industry. We say that the future projection of the production curve will be up—and sharply!

B. P. E.

RPM DELO Oil cuts maintenance costs for...Spokane, Portland and Seattle R.R.

In year-round weather conditions from —30° to 110°F, the big diesels of the SP&S haul passenger and freight trains from the Oregon Coast to Spokane, Washington. Over 100 Electro-Motive, Alcoa and Baldwin locomotives operate here under the most severe railroading conditions. They climb from sea level through desert dust and sand, to mile-high mountains.

RPM DELO OIL RR Special is used exclusively. For over 19 years it has kept heavy equipment rolling on "The fastest track in the Northwest."

SP&S's maintenance crews report: with RPM DELO OIL, they have no lubrication problems and oil cooler problems are held to a minimum. Lower maintenance costs and longer service life are the usual results with "RPM DELO." That's why SP&S, like many major Western Railroads, relies on this special compounded oil.

Constant research, both independently and in cooperation with SP&S and other forward-looking railroads, has kept "RPM DELO" ahead of diesel engine design and use.

Today, a complete family of RPM DELO OILS gives railroad users a choice of lubricants for various engine designs, operating conditions and fuel characteristics. Like more information? Just call your local representative, or write:

LUBRICATING OILS RPM DELO

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • **STANDARD OIL COMPANY OF TEXAS,** El Paso
CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey - Denver, Colorado

TRADEMARKS "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

For more information write in No. 468

diesel power highlights

FACTORY SHARE-THE-OPERATING COST PLANS IN EFFECT

Buyers of Ford and Fordson diesel-powered tractors will be rebated half the cost of their fuel for the first 400 hours, or six months. Nothing to mail in; just take the bills to the dealer where the tractor was purchased. The rebate is retroactive to purchases dating to Jan. 1, until March 31. According to Ford, the rebate is a move to level a seasonal market by providing incentive now, rather than at traditional springplowing tractor purchase time. Diesel tractors now account for one-third of all Ford tractors sold. For several years, International Harvester has paid 6% interest on down payments made in winter on tractor purchases. Interest is paid until spring. This policy has now been extended to other implements. Massey-Ferguson, Ltd., of Canada, will refund $350 directly on new combines purchased in winter.

AMERICAN TRUCKS WITH ENGLISH ENGINES ON MEXICAN ROADS

Several International Harvester BC 170 and BC 180 trucks (18,000 and 22,000 lb GVW) are being fitted with Perkins 6 cyl. diesel engines, the packages to be exported to Mexico. Known as the 340S vehicle-type unit, engines are turbocharged, have been thoroughly checked out to guarantee delivery of 130 hp @ 2850 rpm at an altitude of 8000 ft. Turbo was developed jointly by Engineering Production, Ltd. and Perkins . . . These I-H trucks are the same units powered by I-H's own D-301 engine in the U.S. Lightweight, it shows excellent operating economies when used for short-haul light-load truck operations in city traffic . . . White is also reported to be assembling a package for short-haul light-load, powered by a Perkins diesel . . . Willis has a Perkins diesel-powered jeep for export.

CLEVITE LICENSES ACOUSTICA TO PRODUCE PIEZOELECTRIC IGNITION

Clevite Corp granted rights under its patents in lead zirconate-lead titanate piezoelectric elements to Acoustica Associates. Clevite Electronic Components, a division devoted exclusively to these materials and devices, says other agreements can be expected. Piezoelectric materials bend, twist expand or contacts when electric current is supplied to them, or generate current when squeezed, bent or twisted. According to Acoustica, many new applications will be opened up. Success with gasoline-engine ignition systems may foreshadow use on natural gas engines' spark ignition.

TRUCKERS' REVENUES RISE $4.2 BILLION IN LAST DECADE

ATA's "American Trucking Trends" magazine reports that regulated interstate trucking firm revenues were $2.9 billion in 1949; 1959's revenues were $7.1 billion, an increase of $4.2 billion, or 2-1/2 times the revenue. Today, trucking employs more than 7 million people, annually buys 14-1/2 billion gallons of motor fuel and spends close to $4 billion for new equipment, parts and accessories.

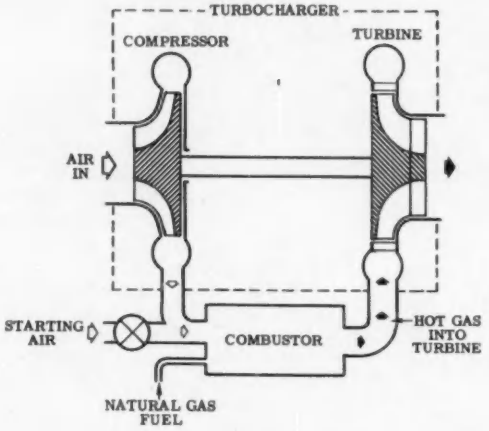
NATIONAL ENGINE USE COUNCIL FORMED

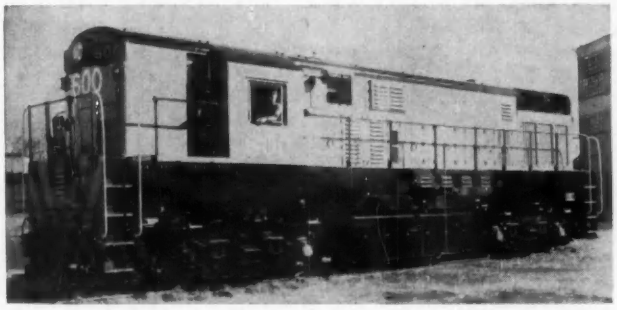
Sixty-four representatives from forty-nine leading companies interested in the sale of engines, fuels and accessories met in Los Angeles and formed the NEUC to discuss ways and means of increasing the sale of engines and through this increase the sale of accessories. Aim is to provide a dynamic program to develop more uses for engine power, to replace less economic power sources with engine power. At this point there's no dues. Address is P. O. Box 22177, Los Angeles 22.

diesel power

news section

Turbos Get Final Okay Here . . .
Drawing at right shows AiResearch's new final production checkout facility for its turbochargers. Consisting of a combustor (operating on mixtures of natural gas and air) connected to the turbo . . . the combustor's hot exhaust gases are used to spin the turbo's turbine wheel. Compressor-side's impeller speed, air flow, inlet and discharge temperatures are taken plus turbine-side's inlet temperature and pressure . . . lube oil flow and vibration are also checked before turbo is given a clean bill of health.





Headed South of the Border . . .
It's the first of nine Fairbanks-Morse 1600-hp diesel locomotives built by F-M for Mexico's Ferrocarril Chihuahua al Pacifico. All nine will leave F-M's Beloit, Wisconsin works by the end of this year . . . plus a F-M 1200-hp switcher to complete the order south of the border.

Injun Territory . . .
Navajo Freight Lines put this specially-painted trailer on regular runs to commemorate the Navajo Indians' new Civic Center at Window Rock, Arizona. It's a new Diamond-T tractor with a GM diesel series 6-71 engine.

ADS Meeting Schedules Program of Service Discussions, Seminars.

The Association of Diesel Specialists forthcoming meeting is scheduled for Feb. 23-26, at the Granada Hotel and Inn, San Antonio, Texas. The ADS is an association of firms engaged in sales and service of fuel injection equipment, governors and related items. It was organized to establish and maintain high standards for service and workmanship in this phase of the diesel service industry.

The first and fourth day of the four-day meeting involves the work of the organization—board meeting, committee meeting, etc. Out of these come projects of importance to the user—correlation of service information, establishment of standards, etc.

The middle two days include an inspection trip to Southwest Research Institute for tour of facilities. Also, dissemination of technical information through service seminars where representatives of member firms and manufacturers can thrash out specific problems. All talks are of special interest.

The How, What and Why of Amot Safety Controls

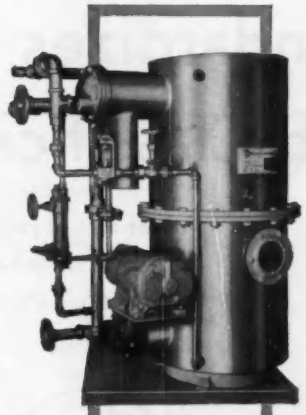
Hot off the press . . . Amot Controls Corporation's 4-page color brochure describing Amot Model 2800A for low cost protection of your diesel, gas or gasoline engines. It's a mechanical unit that guards against operation under excessively high water temperatures or low pressure.

You'll see how it operates, what it does, how it is installed. Four different installations are diagrammed, dependent upon desired functions in connection with shut-down mechanism.

From Clark . . . A Lightweight, Nine-Speed Transmission

Dramatically presented in a new 4-page bulletin is Clark Equipment's 515-lb aluminum 610-ED 9-speed transmission, designed for the modern diesel engine in the 250-300 hp range. The new transmission's light weight and simple design makes for greater fuel savings, easier maintenance and extra driver safety.

The brochure is graphically illustrated . . . there are complete charts and graphs with specifications and scale drawings.



AMF

MAXIM =

FUEL-FREE FRESH WATER FOR DIESEL OWNERS

AQUAVAP Heat Recovery Evaporators depend on engine jacket water, or any other hot water as a heat source. Hence they produce fresh water from available sources of salt or brackish water without any extra fuel cost. They are low in initial cost, inexpensive to maintain and simple to operate. They are delivered as a complete packaged unit ready to install. There are 5 models in the Aquavap line with capacities ranging from 150 gallons per day to 12,500 gallons per day. Other AMF-Maxim evaporators are available with capacities ranging up to more than 1,000,000 gallons per day. The purity of water produced exceeds U. S. Dept. of Health requirements.

Wherever Diesels are used, or wherever hot water is available, the Aquavap is an extremely practical water producer. It is ideal for many uses such as remote mining operations, construction camps, offshore or land based oil drilling, workboats, yachts, coastal resorts, military installations, and a multitude of others. Write for our illustrated Aquavap Bulletin.

AMF MAXIM EVAPORATOR DIVISION
American Machine & Foundry Company
6 MILL LANE, WATERFORD, CONN.

For more information write in No. 469

ADS Standardizes Job Classifications

What sort of repair job did you have in mind?
Does the shop have the same picture?
Now there's a way to get a meeting of the minds.

We all talk the same language but too often fail to communicate. Words don't always mean the same thing to all people. A fuel injection pump is delivered to a repair shop with a tag on it simply saying, "Repair and return." This can mean anything from just getting it working to a complete "as-new" rebuild. Sometimes the customer himself doesn't know the difference in work involved, the parts used and relative costs. How then is the shop expected to know how to proceed?

Suppose someone comes to you and says, "Don't take your pump to him. I'll overhaul it for X-dollars less." What does "overhaul" mean? What work is included? What parts? And what kind of warranty can you expect? Finally, on what basis can you make a decision on where you would get the best value for your dollar.

Here are two areas of uncertainty —one on the part of the shop, another on the part of the customer. Failure to communicate specific meanings has been the source of a lot of misunderstanding, bad will and downright distrust. The Association of Diesel Specialists has been well aware of the situation created by this "language" barrier and has done something about it.

The Standards Committee, headed by Lloyd Bailey, Diesel Injection Service, Louisville, Ky., prepared a set of recommendations. These were presented by committee member Manuel Gerhardt, Gerhardt's, Inc., New Orleans, La. At the September 1960 ADS meeting, the recommendations were approved by the membership.

Three job categories were spelled out. It was recommended by the committee that the industry be advised of these classifications and their meanings. Furthermore, member shops should consciously display this information as a guide and to acquaint their customers with the differences in jobs which, of course, is reflected in their costs.

As this information gets broader dissemination and the terminology is better known and used, it should go a long way toward solving current problems. It represents another forward step by the ADS in improving their industry's condition to benefit the customer. It's another reason to look for the ADS seal when you need fuel injection equipment or governor work done.

ASSOCIATION of DIESEL SPECIALISTS — ACCREDITED DEPENDABLE SERVICE — Member — A·D·S

FUEL INJECTION EQUIPMENT

REPAIR STANDARDS

The standards of job classifications, as outlined below, have been prepared and adopted by the Service Members of the Association of Diesel Specialists in an effort to standardize work classifications in all areas—both foreign and domestic.

CLASSIFICATION I-Complete Overhaul

(Return in Like New Condition)

- **A** Complete disassembly of unit and component sub-assemblies.
- **B** Thorough cleaning and close inspection of all usable parts.
- **C** Reassembly of these parts to the unit, provided the parts meet with the manufacturer's requirements. Missing, worn or broken parts will be replaced with original manufacturer's parts.
- **D** Test sub-assemblies and complete assembly with adequate test equipment in accordance with manufacturer's test recommendations.
- **E** This classification of repair carries a 90 day warranty, but not exceeding 25,000 miles or 1,000 hours of operation.

CLASSIFICATION II-Necessary Minor Repairs

- **A** Repairs of defects to a sub-assembly and/or complete assembly, as designated by the customer or noted by the service shop after a visual inspection.
- **B** Test unit and sub-assembly according to manufacturer's recommendations and report findings to the customer.
- **C** Under warranty period, the repair station is only responsible for that portion of repair work which it was instructed to perform.

CLASSIFICATION III-Test Only

- **A** External cleaning of complete assembly and testing of assembly according to manufacturer's recommendations.
  - (1) If the test does not meet with requirements, the customer will be advised and permission will be requested to make further repairs, either under Classification I or II.
  - (2) If the test does meet with requirements, the unit will be returned to the customer for service, but the repair station WILL NOT be held responsible for the longevity of the unit since the internal mechanical parts were not visually inspected and the unit not overhauled.

"ACCREDITED-DEPENDABLE SERVICE"

Up In Front with a New Look!

Consolidated Freightways has placed nearly 2000 equipment units in service to date as completion of its system-wide fleet modernization and replacement program is reported.

The emphasis has been an intercity equipment, and takes in CF's dry freight and reefer service, bulk commodities operations, city pick-up and delivery service as well as its Canadian Freightways subsidiary operations in five Canadian provinces and the Yukon Territory.

The intercity power units include 164 long and short wheelbase sleeper diesel tractors.

William G. White, president, in making the report emphasized the goal of the modernization program "to provide the shipper with the best in general and specialized equipment that will suit every conceivable need."

Learn All About 'Em . . . Course Offered on Diesel Electric Sets

Telephone Company employees are being offered a specialized training course in the installation, operation and maintenance of standby Diesel Electric sets by the Detroit Diesel Engine Division of General Motors. Western Electric Company collaborated in the preparation of the course which has been added to Detroit Diesel's regular service training program at the Division's Product Service Training School in Detroit.

All features of the Series 71 Diesel engine including design, will be covered.

The two-week course, limited to 12 trainees at a time, also includes generator design and construction, generator trouble shooting, voltage regulation, automatic starting and shut-down and parallel operation.

The News is Down Under!

A "new concept" in equipment to power railroad refrigerator cars comes from Stewart & Stevenson Services research and development.

Tests are nearly completed on an "undercar" generator unit that has a great potential in new "reefer" car installations and still more in the conversion of thousands of ice bunkered railroad cars.

All major generator components will be installed under the reefer cars with only a small partition at one end needed for evaporator fan and condenser fan.

It has been estimated that about half of the approximately 32,000 ice bunker cars being used by U.S. railroads today can be converted.

Space savings as well as the obvious advantages of unattended refrigerant equipment for cross-country movement will result from the new S & S design.

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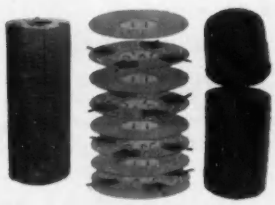

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diesel power

news—people & plants

C-B Names McCoy and Koch To Sales Positions

Eugene McCoy, programming analyst for the **Cooper-Bessemer Corp.** has been appointed assistant manager of gas engine compressor sales. Mr. McCoy has been with the company since 1954 when he was a co-op student at the University of Cincinnati. He holds an ME degree.

Donald T. Koch will manage the new Detroit branch sales office, serving eastern Michigan and northwestern Ohio areas of the East-Central Sales District. Mr. Koch joined C-B as a sales engineer in 1956. He received his ME from Cornell University in 1954.

In addition to direct factory representation, Cooper-Bessemer will continue to be represented by the **Russel and Olson Co.** with offices in Detroit, Grand Rapids and Flint. The firm also represents the Rotor Tool Co., a wholly owned subsidiary of Cooper-Bessemer, manufacturing a complete line of compressed air driven tools. The new C-B branch will handle heavy duty engines and automatic controls, while Russell and Olson will represent the industrial air compressor line.

". . . by another name . . ."

Detroit Controls Division of **American-Standard** is now to be known as the **American-Standard Control Division.**

According to **F. J. Kreissl,** President, the new name identifies the new division more closely with American-Standard, the parent organization, makers of plumbing, heating, kitchen and air conditioning products as well as a wide range of products for commerce and industry.

The commercial line includes air handling and processing equipment, fluid drives, heat exchangers, pig iron, nuclear reactors and advanced electro-mechanical devices.

Burton M. Joseph

Joseph Joins Young Radiator

Burton M. Joseph takes over as Sales Manager of the Industrial and Oil Field Division of the **Young Radiator Co.,** according to a recent announcement.

Mr. Joseph was formerly associated with Griscom-Russell Co. as Sales Engineer, by Yuba Industries as District Sales Manager, and immediately prior to his appointment at the Young Radiator Co., was General Sales Manager of Solar Chicago, a division of U.S. Industries. He is a native Chicagoan and was a Captain in the Army Air Force in World War II.

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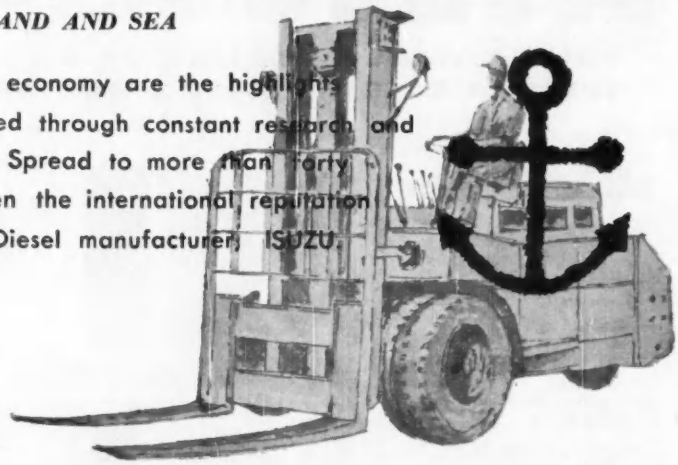

for further information, write to:

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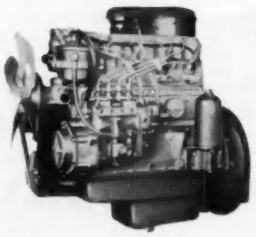
649 South Olive Street
Los Angeles 14, Calif.

ISUZU MOTOR CO. LTD.
Export dep't (DP-1)
2691 Oi-sakashita-cho,
Shinagawa-ku, Tokyo, Japan
Cable address ISUZU TOKYO



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Service in a Big Way

The new headquarters building for **White** and **Autocar Trucks** now under construction in Watertown, Mass., will have the largest service area for trucks in the Northeast. In addition to 46 service stalls, there will be a chassis dyamometer, two complete lubrication areas and one wash area. The new building will also house offices, the latest in parts storage and service facilities, a machine shop with specialized equipment and completely engineered building facilities.

J. N. Bauman, the company's president, has indicated that the new facility is part of White's long range program to meet the needs of truck users efficiently and economically. When completed, the Watertown building will replace the sales and distribution center now located in Boston, Mass.

Equipment Service, Distributor for P & H.

Territory including Southern California counties of Kern, Inyo, San Luis Obispo, Los Angeles, Orange, San Bernardino, Riverside, Santa Barbara and Ventura plus Clark county, Nevada will be taken over by **Equipment Service Co.,** Long Beach, California as distributor for **P & H** industrial and marine diesel engines.

The ten year old company will provide service by factory trained mechanics and P & H parts will be stocked. **Vincent Cortes** is owner and **James McDonald,** secretary-treasurer.

Management Personnel for Cat's New Swiss Subsidiary Named

V. V. Grant, R. H. Deffenbaugh, J. R. Hawk and **G. J. Preston** have been named President, Secretary-Treasurer, Sales Manager and Parts and Service Manager, respectively, as Caterpillar opens its new Swiss subsidiary, Caterpillar Overseas, S. A. Appointments were announced by **L. B. Neumiller,** Chairman of the Board and **H. S. Eberhard,** President.

Mr. Grant has been a vice president of Caterpillar's Foreign Trade Group and an officer and director of various subsidiaries since 1956. He also served as treasurer of the parent company for ten years.

Mr. Deffenbaugh was general credit manager for both domestic and export business and has been treasurer of various Foreign Trade Group subsidiaries since joining the company in 1947. Mr. Hawk has been with Cat since 1947 in various sales management positions. Mr. Preston joined the company in 1940 as a trainee and has been foreign parts manager since 1956. They will all work out of Geneva.

Morrison, Metalock Veep

R. C. Morrison has been appointed Vice President and General Manager of **Metalock International,** Inc., manufacturers of the Metalock Cold Repair Systems.

Mr. Morrison was formerly associated with United Specialties as president and general manager.

Metalock directors also announced a broadened plan for additional franchise agencies for the Metalock repair process.

Jack Hughes, left, examines recent Ren Crankcase Oil Level Regulator installation. They're attached to 15 gal crankcase oil storage tanks on each of his 650 pumping engines.

Today's Diesel Man . . .

Jack Hughes eliminated crankcase condensation with Hanson Mfg's variable pitch fan. It's standard on his engines.

story and pictures by Paul B. Harder

"Subsidence Halted!"

Splashed across the front page of Long Beach, California papers, this headline signaled a significant victory for Harbor area oil producers. They had won their battle to halt the dramatic and costly sinking into the Pacific Ocean of the industrialized Long Beach Harbor area and parts of the city of Long Beach proper.

To Jack Hughes, mechanical superintendent for Long Beach Oil Development Company, largest oil operator in the harbor, it meant that one of his newest and largest responsibilities—the maintenance of 20 500-hp natural gas engines used for re-pressuring the sinking field—was paying off.

Why It Sunk . . .

The sinking city has been—still is—a great concern to Long Beach. Largely as a result of oil extraction, land covering an area of over 20 square miles of industrialized Long Beach Harbor has sunk up to 26 ft during the past 20 years, causing millions of dollars of damage to surface and pipeline installations for a score of different industries. Nearly $100-million has been spent repairing property damage, 20-million cu yd of earth has been trucked in to keep the harbor facilities from being entirely submerged.

Culmination of 15 years of research by 25 different groups of consultants (in addition to survey work by the big operators tapping the field) was a $75-million water flood program. Goal of the program: stop the sinking by pumping water at great pressure and in astronomical volume into major producing zones.

Jack Hughes—Picked to do the Pumping . . .

Until this program was outlined and adopted, Jack Hughes' responsibilities had already given him some distinction among maintenance people. He had 650 4- and 6-cyl natural gas engines operating around the clock on producing oil wells dotting dikes, piers and

R. M. Gray
Superintendent of Operations
Long Beach Oil Development

"At Long Beach Oil Development the mechanical superintendent is classified as a department head—and a mighty important one, too. He's got to be a skilled technician, an alert administrator; he's got to be able to change with changing techniques. He must be able to keep an eye on costs.

"This demands a lot of know-how—a degree, a short-course, they don't fill the bill. Just years of experience."

jetties of the harbor as well as the additional responsibility of keeping nearly 100 cars and trucks in operation. All of this in a continually damp, frequently cold and always corrosive waterfront area.

Long Beach's water flood program added a new duty that was huge and dramatic. Plans called for the injection at pressures as high as 2000 psi of 50-million gal of water per day into the Wilmington oil fields' producing zones. The engines slated to carry this out were going to be Jack Hughes' responsibility.

The 600,000-gal per day pilot plant, which was to prove the theory of the water flood operation, went "on stream" in 1958. A battery of four VLROB Waukesha V-12's and 16 of the 6597 cu in. Model 8-C825 White Superiors drove the reciprocating pumps that rammed water back into the producing zones.

"When I got into oil field work," reflects Hughes, "it was with an oil field mechanical background typical of the depression years. Until joining Long Beach Oil Development in 1943, my most impressive contribution to the oil industry had been conversion of used Hudson automobile engines into power units for the old "walking beam" pumpers. My whole perspective changed when I came to LBOD."

It's hard to find a responsible man in the field end of oil operations whose hands don't bear the scars of drilling and production work. Jack is no exception. Many pumping unit engines for which he is now responsible are pumping wells he helped service while working with Long Beach Oil Development's production department in 1943.

Jack's talent for keeping engines running, moved him quickly out of production and into maintenance, where he's been ever since.

"When I came into maintenance in 1946," recalls Hughes, "Long Beach Oil Development had 50 to 60 wells being pumped by natural gas engines, maybe 10 or 12 vehicles."

A growth that has seen LBOD jump from a 50-well operator to a 650-well operator in less than two decades suggests the speed with which Jack Hughes' responsibilities have increased. But it doesn't hint at the complexities involved in maintenance or equipment on the waterfront of a sinking harbor.

Water in the Crankcase . . .

"The ocean has been a problem of mine since long before we found we were sinking into it," notes Hughes. "Operating internal combustion engines in this damp, cool air—many of our rigs are right out on the ends of the piers—used to cause us a lot of trouble and cost a lot of money."

Shortly after Jack Hughes moved into maintenance he began checking into problems causing excessive ring, cylinder and bearing wear. Finding water—as much as a quart a week—in crankcases of many engines gave him his clue.

"Right away we began sampling the crankcase oil, sending it out to a lab for analysis. During winter months many of our engines—particularly those on the exposed piers—operated at low temperatures even under full load. We found a relationship between ambient conditions, engine location and crankcase condensation."

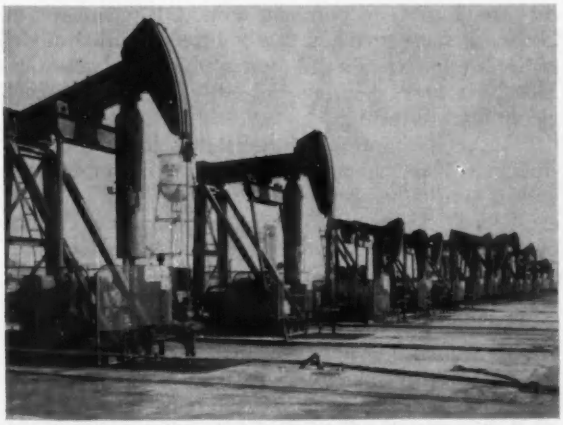
Jack Hughes went to a variable pitch fan manufactured locally by Walter Hanson Mfg. in Bellflower, California. Its mechanical and fully-automatic operation was controlled by water temperature. Hughes adjusted the fan thermostats to maintain a water temperature of around 160°F (an oil temperature of 175° to 180°F).

Result has been that where LBOD had experienced cylinder wear on the order of 0.016-in. to 0.018-in. per year, they're now getting two-and-a-half years before an overhaul and are running as long as a year without an oil change!

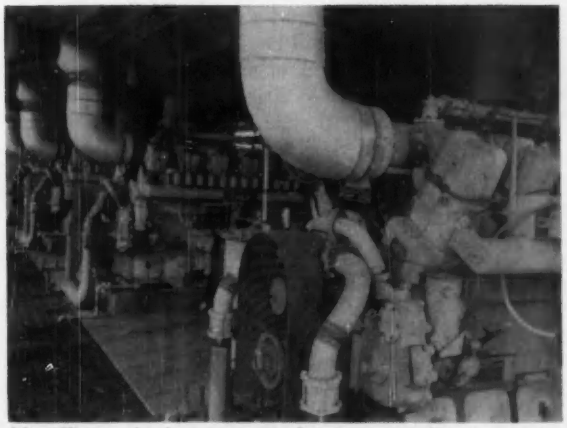
Experiments with his Engines . . .

With ever increasing numbers of engines (they are divided in equal portions between Allis-Chalmers, Waukesha and Minneapolis-Moline with a few Le-

(Continued on page 28)

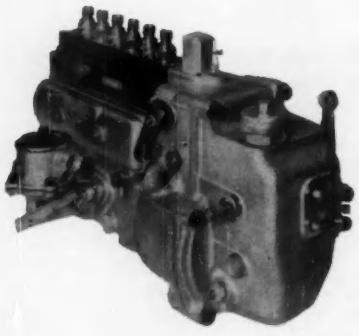


Pumping 'round the clock, these natural gas engines are exposed to corrosive moisture, ambient temperature changes.



50-million gal of water per day is pumped into sagging oil fields by 20 500-hp Waukesha and White-Superiors.

BENDIX-SCINTILLA Gets Simms line



Contract with British Firm broadens Scintilla's Injection equipment product line

On Monday, January 9th, the Scintilla Division of Bendix Corporation concluded a sales and manufacturing agreement with Simms Motor Units, Ltd. of Great Britain. This puts Bendix-Scintilla in a good position to compete in the multi-cylinder high-speed diesel fuel injection equipment field.

Simms is the world's largest producer of in-line fuel injection pumps and their latest version, the Minipump, is widely used abroad. For example, they are used on Ford's engines built in Dagenham, England. Simms has extensive production facilities in Finchley, just outside of London, and is expanding. They also make automotive and other types of electrical equipment and specialty items such as their line of CR couplings.

Under terms of the agreement Scintilla gets exclusive rights in the United States to sales and manufacture of the Simms line of fuel injection pumps, nozzles, filters and couplings. Scintilla also obtained non-exclusive rights for Canada, Mexico and Brazil.

Scintilla told us that the first stage would be to import their requirements. Later, when a predictable sales volume has been established, manufacture will be considered. Marketing will include OEM sales and trade sales through Scintilla's present sales and service organization. Steps are being taken to augment the sales and service organization to handle the expanded product line.

Scintilla is also building up an applications engineering group and facilities for engine testing. This will back up their OEM sales efforts. While the responsibility for this applicational engineering rests with Scintilla, they will be able to call on Simms for any necessary technical assistance.

Simms' production volume speaks for the quality of product. Also, it is a factor, along with design and extremely efficient tooling, that contributes to relatively low-cost fuel injection equipment. All this accrues to Scintilla and puts them squarely in the high-speed multi-cylinder diesel field. At the same time, Simms are in no way limited in expansion of their own line of products.

and here's the Minipump . . .

A general description . . . .

Simms' Minipump follows the trend of what's been happening to fuel injection pumps but with individualistic overtones. In general, pumps have been getting smaller and lighter without sacrifice in capacity. Service life has been increased and ease as well as cost of maintenance improved. The Minipump is no exception. How it was done and the particular design approach used by Simms will be detailed.

So far, Simms has specialized in the in-line multiplunger type pump and is Britain's largest producer of this type equipment. In view of the widespread use of small diesel engines in Britain and on the Continent, it's not surprising that the Simms "A"-size pump makes up a good share of their production. They are widely used on a variety of small engines for farm tractor, light truck and industrial use. For example, all the British-built Ford diesels use them.

Minipumps, including the Minimec with a mechanical governor and the Minivac with a vacuum-type governor, were built to be the "compacts" in the "A"-size pump field. Plunger-axis spacing was reduced to make a shorter pump and height was held to a minimum by component design. Let's take a closer look at the design features.

Basic designation is the SPE-M. "S" is the Simms; the "PE" is the common designation for in-line, multiplunger types; and "M" stands for Minipump. The "M" can be preceded by a "3," "4" or a "6" to indicate the number of pumping units. GP pneumatic or GE mechanical governors can be fitted. Another model of the Minimec uses a still more sophisticated governor. Here, the lower housing and half the governor case are an integral casting.

Plungers having from 6.0 to 9.0-mm diameter can be installed. This makes the pump suitable for engines with a maximum swept volume per cylinder of up to 1.5 litres (91.53 cu in.). Port and metering helix control of delivery is used. Start of injection is constant and termination controlled by the portion of helix in register with the spill port, a feature which results in controlled light-load running even at the highest speeds.

This sequence is illustrated. Note the control lever for rotating the plunger. This is an attachment. Diameter of the plunger itself is the maximum diameter of the piece and absence of integral arms or other protruberances simplifies manufacture. Also note the

angled slash-cut forming the helix and cutting into the central bore. This, too, simplifies manufacture. All this helps reduce costs of the barrel and plunger assembly, one of the more costly replacement items during servicing.

While the general arrangement of the necessary components is the same as in conventional "A" pumps, many design changes were made to make the overall package more compact and easier to service.

Cutting the size . . . .

The pump casing is split horizontally. The lower half or cam box is a light alloy casting; the top half or pump body is steel. The pump body contains the fuel passages and pump elements. It can be removed for inspection of the pumping elements without disturbing the camshaft.

Use of steel makes it possible to reduce plunger spacing and make a shorter pump. The steel pump body surrounds the high-pressure end of the barrels, supporting them and providing all the strength needed for the largest plunger size and highest injection pressures.

Barrels fit into the pump body bores from the top. Serrations (on the smaller diameter below the section containing the inlet and spill ports) match serrations in the body. This gives positive barrel location. The delivery valve with its retraction piston, its guide and holder lock the barrel in place. The holder is serrated and screwed into place with a special wrench. Actually, spacing is so close that there wasn't room for the conventional hex head. Service men will appreciate the steel-to-steel threads.

The lower half of the pump casing or cam box is a light alloy casting. It provides support for the camshaft and guide bores for tappets. Oil for cam and tappet lubrication is contained in its base.

Close plunger spacing means that cam spacing is correspondingly reduced. Result is a short, rigid camshaft. Also, more weight is saved. The shaft turns on heavy-duty ball bearings.

Above each cam is a tappet guide bore. These are made in pairs as illustrated. A tappet-locating "T" piece floats between the tappets in each pair of bores. Roller-type tappets with wide rollers to match the generous cam faces are used.

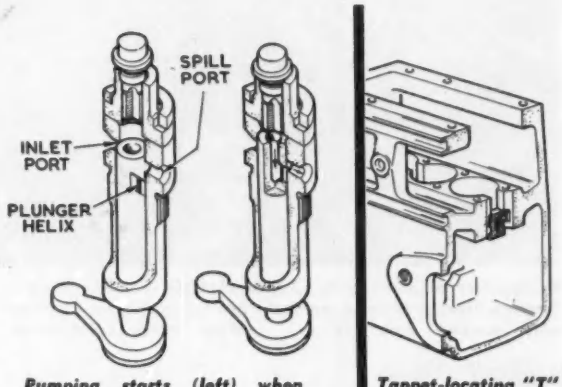
Length of reciprocating assemblies was held to a minimum by component design and use of what amounts to shimming for timing adjustment. Spacing pieces of the required thickness are inserted in the top of the tappets and held by circlips. Spacers come in graded thicknesses.

Similarly, clearance between the plunger arm and the bottom spring plate that rests on the top edge of the tappet is controlled by spring plate selection. These also come in graded thicknesses. A slight clearance (0.05 to 2.0 mm) between the arm and spring plate when the plunger end is resting on the tappet pad is necessary for free plunger rotation.

Setting is easy . . . .

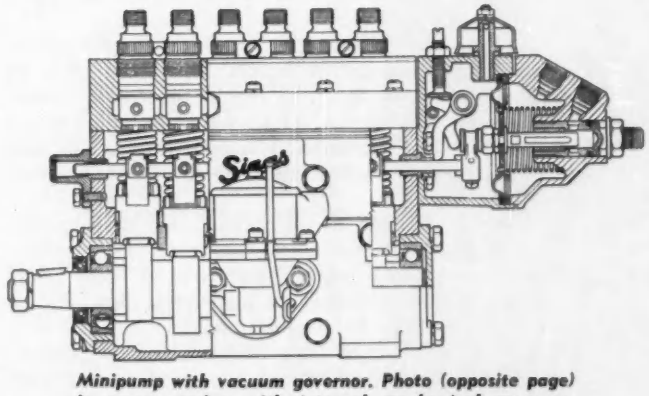
Access for making these adjustments is good. The pump body will have been removed for inspection and possible replacement of parts. For timing adjustment,

(*Continued on page 39*)

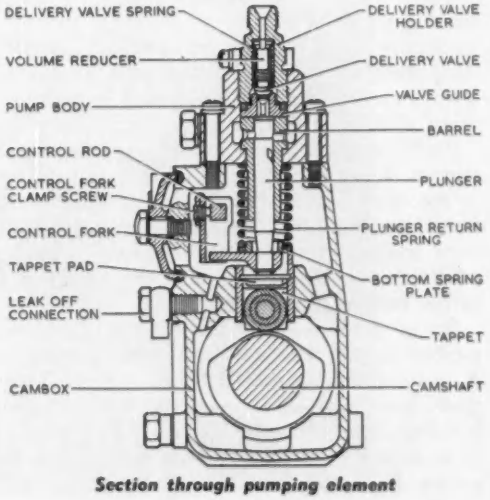


Pumping starts (left) when plunger closes inlet; ends (right) when helix uncovers spill port.

Tappet-locating "T" piece floats between each pair of bores.



Minipump with vacuum governor. Photo (opposite page) is pump version with integral mechanical governor.



Section through pumping element

New Application:

DIESEL does new job

Brand new applications for diesel power turn up daily . . . here's one where a Cummins supplies air to make noise.

What's an "Intense Acoustic Facility for Flight Vehicle and Electronic Research?" Bolt Beranek and Newman Inc., a research group with facilities in Cambridge, Mass. (also Chicago and Los Angeles offices), explain that it's a "unique sonic failure research facility . . . constructed for the USAF for testing flight vehicle structures and electronic systems in the pressure of high intensity sound."

Still not clear? Well, the purpose of the facility is to find out what happens to materials in the structure of planes, rockets or missiles and electronic components of these when they are exposed to intense sound pressures. The resulting vibrations, frequently leading toward fatigue and other types of failure, are known to be encountered by these types of equipment.

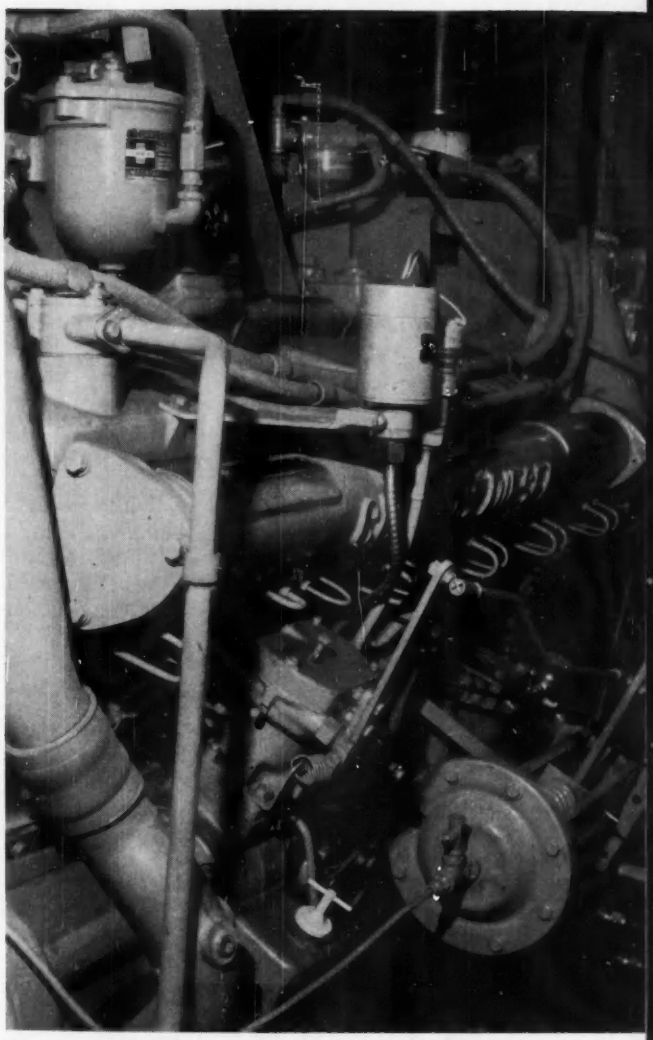
Generation of the intense sound needed for this test work starts with diesel power. This installation is a good example of the many new and varied applications that are opening up as technology expands into new areas. A few years back, no need for this prototype installation existed.

Here's what happens . . .

Sirens are used as a sound source. They will produce pure tones or narrow bands of noise throughout the frequency range from 50 to 10,000 cycles per second. Amplitude modulation is controlled from 0 to 50 cps. Two sirens are installed, capable of simultaneous operation at different frequencies.

Test specimens are located in a progressive wave test section. Their response to the sonic energy, controlled in accordance to the specific test program, is observed. Sound waves are then attenuated in a carefully-designed horn leading to an acoustically-treated chamber, after which they must pass through two mufflers in series before entering the atmosphere.

Sound is a problem in two respects—first it has to be created; second, it has to be extremely well dissipated. A new building, attached to the existing modern offices, was built. Also there are several surrounding buildings. The whole facility has to be a good neighbor with respect to both the sonic testing and its power source—the diesel.



Compressor supplies air for Taylor throttle control. Above is Synchro-Start overspeed control; behind it Electro-Mechano tach sending unit. At top, cooling water conditioners.

Power to make noise . . .

In order for a siren to function, it must have a large supply of compressed air. Interrupting or continually "chopping" this escaping air by ports in a rotating disc produces sound waves.

At maximum output the two sirens require about 6000 cu ft of free air per minute at pressures up to 15 psig. Calculations indicated that a supercharger from a model R-4360 Pratt & Whitney aircraft engine would meet these specifications. Moreover, the USAF had some spare engines from their obsolete B-36 bombers available.

The prime mover would require about 500 hp and a maximum rotational speed over 2000 rpm to drive the blower section removed from one of these 28-cyl gasoline engines. Obviously, a high speed diesel engine would be ideal for this application.

Cummins Diesel of New England, Inc. in Allston, Mass., right near the Cambridge location, worked with the research group to insure good operation. The en-

gine selected was a Cummins VT-12-1, 600-hp at 2100 rpm unit. Several special features were required in the installation.

First, the engine-compressor was to be mounted on a common sub-base and this base flexibly supported. A special plate was built to support the blower-half of the aircraft engine. A front bearing for support of the blower drive had to be built as the original bearing was part of the discarded half of the engine. Then a Thomas coupling was machined to connect the diesel to the compressor drive.

This whole assembly was mounted on specially-designed spring-type Korfund vibration dampers. This prevented transmission of engine vibration to the building structure. All connections to the engine have flexible sections to permit free engine movement. The engine was run before the dampers were bolted down and operation was so smooth that it just "sat" with no tendency to "walk."

Air for the compressor and engine enters the building through a silencer. Two oil-bath air cleaners filter air for the twin turbochargers. Engine exhaust is piped to the outside and effectively muffled by Maxim Silencers.

The fuel system is conventional with supply from tank storage outside the building. City water and heat exchangers are used for engine cooling. Also, the compressed air from the blower is cooled. Thermostatic control of water through an air-to-water heat exchanger maintains the desired air temperature.

The engine-compressor operates in the siren room where during testing, noise intensity is, to say the least, uncomfortably high. Remote control was therefore desirable and an acoustically-isolated control room provided. Basically, the engine is a self-contained unit with its own safety devices. Engine rpm is indicated in the control room and, indirectly, speed is controlled from there.

Air pressure at the sirens is adjusted and monitored in the control room. A large volume of air is required at pressures up to the compressor's maximum at the surge line of about 15 psi. Most operation is well below this. The desired pressure is set and an air pressure sensing device located in the compressor air cooler takes over. It acts on the pneumatic control on the engine throttle to set engine speed to give the proper pressure at the sirens.

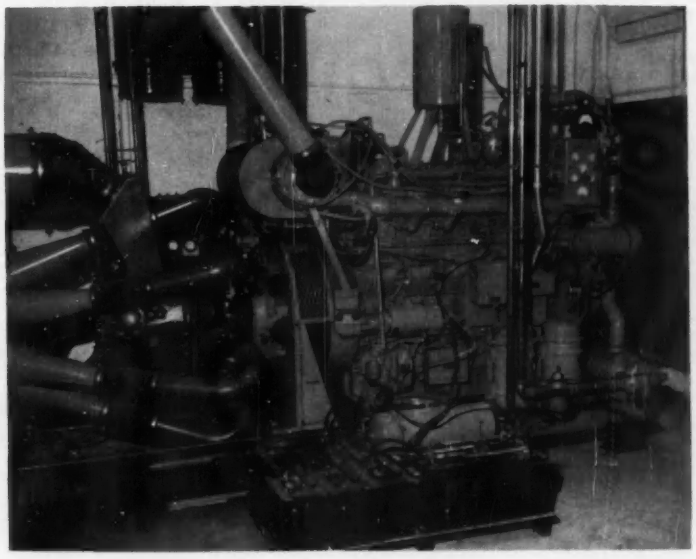
New frontiers, new engine applications . . .

The installation has lived up to all expectations. Bolt Beranek and Newman Inc. has completed their project on the Air Force contract calling for the design and construction of this prototype facility. Cummins Diesel of New England, Inc. is happy with another satisfied customer.

Odd-ball installation? Certainly not! As technology explores new frontiers there will be many new applications for prime mover power, applications unknown a few years back. It's an expanding field for economic, dependable diesel power.

Major Equipment On Engine

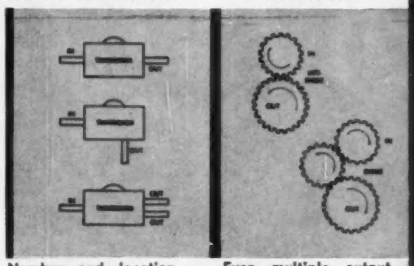
Control (throttle)	Taylor Instrument Companies
Air Compressor (controls)	Bendix-Westinghouse Automotive Air Brake Co.
Lube Oil Filters	
Full Flow	Wm. W. Nugent & Co., Inc.
By Pass	Luber-Finer, Inc.
Fuel Oil Filters	Cummins Engine Co., Inc.
Overspeed Control	Synchro-Start Products, Inc.
Tachometer	Electro-Mechano Co.
Pyrometer	Alnor Instrument Co.
Silencers, Air	Vortox Mfg. Co.
Silencers, Exhaust	(Maxim) J. B. Beaird Co., Inc.
Thermostats	Amot Controls Corp.
Thermostatic Valve	Fulton Sylphon Division Robertshaw-Fulton Controls, Inc.
Oil Cooler, Compressor	Whitlock Mfg. Co.
Vibration Insulators	The Korfund Co., Inc.
Coupling	Thomas Flexible Coupling Co.



Cummins diesel coupled to Pratt & Whitney compressor. Both are mounted on sub-base, supported on spring-type Korfund vibration dampers. All connections have flexible sections to allow movement in operation.

"Custom" Transmissions are the "Standard"

Planning a special transmission?
Here are some variables . . .



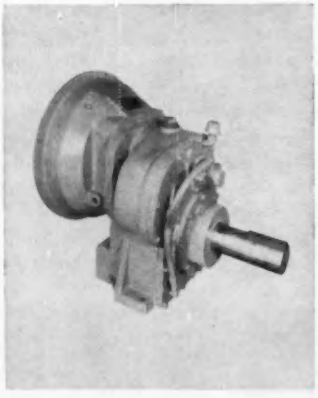
Number and location of output shafts often reduces need for many other components.

Even multiple output shafts and PTO's can be built to suit rotational needs.

Specialists in the "Special" Cotta Transmission Co. designs and builds heavy-duty power transmission devices for special application

Design of a special underground mining truck called for a tricky power transmission arrangement. Height and width limitations were rigid. Power had to be transferred to the side of the engine for drive at both front and rear. Prototype designs using standard equipment available involved two transfer cases and a forward-reverse gear unit, plus connecting U-joints and "hardware."

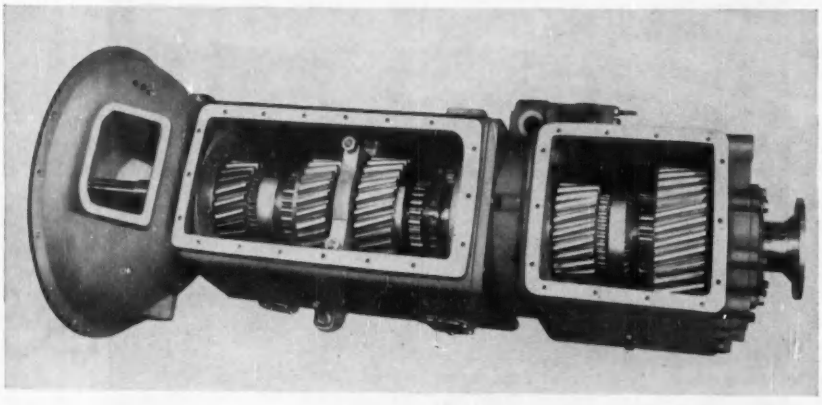
In the final design, one customized unit did the whole job, requiring only connection to the driven equipment with U-joints! There was a saving of weight, space and complication. This customizing job was done by Cotta Transmission of Rockford, Ill.



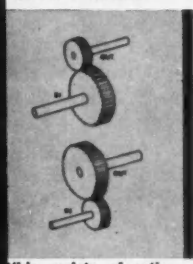
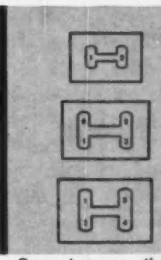
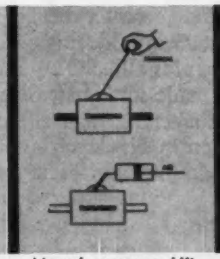
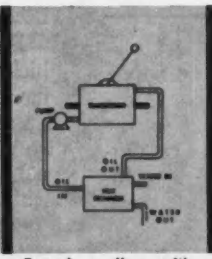
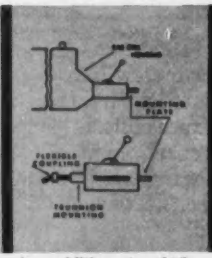
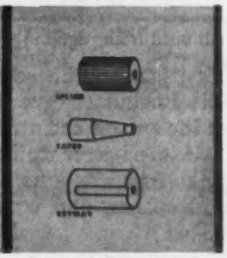
Single-speed reduction is one standardized component, offered as OEM, popular with pumping rigs.

". . . It Could Cost Less!"

Many people automatically shy away from the word "custom-built" because of its frequent association with high costs. Recognizing this, DIESEL POWER asked Mr. Bob Wadlington, Sales Manager, Cotta Transmission Company, how much extra customizing *did* cost. He replied, "More cost than what? If it's a unit tailored to do a particular job compared to a so-called standard unit, similar but not doing the job exactly, it might run 20% to 30%. If you are comparing a single unit that takes the place of two or three standard drive line items, it could cost *less!* Then in some cases, the special unit is the only thing that will do the job; no suitable standard units are available. How can you compare costs in this case?"



Six-speed 600-hp capacity transmission was built for an oil field fracturing rig to suit special requirements.

SHAFT SPEED	MULTIPLE SPEEDS	SHIFT CONTROL	COOLING	MOUNTING	OTHER OPTIONS
					
Vide variety of ratio ptions permits any esired shaft speed at ny engine speed.	One, two or three-speed forward with one reverse are basic. Other patterns are available.	Manual or power shifting, hydraulic or pneumatic, can be had to suit application.	Forced cooling with pump and heat exchanger may be needed in high-power heavy-duty use.	In addition to SAE bell housing mountings, other special mounts are easily engineered.	Type and dimensions of shaft are custom for special clutches or torque converter.

How long did it take to get a customized units. Mr. Wadlington commented, "Again, this will depend on the individual job. I'd say in most cases, it would not be over 90 days from the laydown of the design to delivery.

"We do have some standard items for quicker delivery," he continued, "These are single-speed reduction or over-speed gear transmissions. Built with standard SAE housings for direct mounting to engine flywheel housings, they provide for engine rotation or anti-engine rotation in a number of different ratios. Sizes are built to handle from 120 ft-lb to 2400 ft-lb torque.

"We have another item for diesel generators on the boards that we may build as a standard unit. As you know, diesel engines are going up in speed every day. Matching engine speed to common generator synchronous speeds is often a problem. We plan a compact unit with appropriate ratios to go in between. Then it won't be necessary to derate engines just to match the generator's synchronous speed."

. . . Customizing Should be Considered

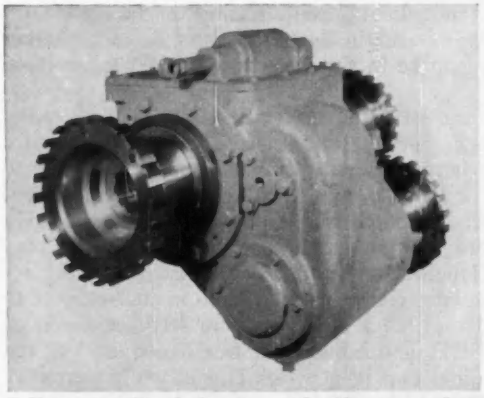
There's much to be said for use of standard shelf items but as a general rule, the advantages apply when *the items are used in standard applications.* When the application is special—and today so many diesel power installations are—customizing of power transmission equipment frequently is a better bet, both from the functional and overall cost viewpoint.

Bob Wadlington's Cotta Transmission Company products are a good example of customized units. Cotta has been building power transmission equipment for over 50 years—transmissions, power takeoffs, transfer cases, reduction or step-up gears. They're all based on standard designs, customized to meet a specific set of requirements.

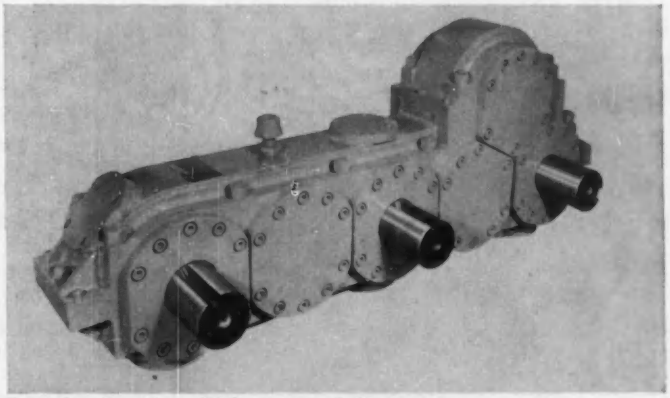
What does "customizing" mean? In this case it means modification of a proven design to do the required job. When you've specialized in "special" transmission units for years, as Cotta has, you amass a number of basic designs and a tremendous backlog of know-how. The equipment designer may think his drive problem is unique but chances are that Cotta has built a similar unit in the past or at least something like it. Thus, the "customizing" becomes a matter of modification rather than starting a design from scratch.

What are some of the variables? Major ones have been illustrated to show the options available to the machinery or equipment designer. Next step in customizing is to determine exactly *what* you want to do. For this a checklist is helpful—a checklist that includes such information as engine model, of course, and transmission's output shaft rotation. Then the customizer will also need to know ratio required . . . nature of

(*Continued on page 39*)



Full power-split shaft-power takeoffs may reduce cost by eliminating need for other components.



Special unit with multiple output shafts for use with coal mining augers. Note access to gearing.

Today's Diesel Man . . .

(Continued from page 21)

Roi's), Jack and his 49-man crew have done an appreciable amount of experimenting trying to increase engine life and cut maintenance costs.

"We tried every major spark plug on the market during the first few years I was here. We tested lube filters, air filters and vee-belts. Some of the things we tried we'd never heard of before—a few we've never heard of since! We still look, still read the trade books, still hope to find a new idea that will stretch the life of these engines."

Experimenting resulted in a significant departure from normal crankcase maintenance techniques. With oil level controlled by a Ren regulator—a device with which Long Beach Oil Development did some pioneering work years back—Jack has each engine connected to a 15-gal crankcase oil reserve drum.

"The tendency of service men," explains Hughes, "is to put plenty of oil in the crankcase. If they find an engine is using a little oil, they'll throw in an extra quart to make sure it doesn't get below the danger mark before their next visit. Effect is to speed up cylinder and piston wear by carboning up the rings through excess oil splash. By automatically maintaining ideal crankcase level, we've eliminated this problem . . . and we've also saved a lot of service time.

An Executive With Down-to-Earth Experience . . .

Jack Hughes used to spend his time in the field overseeing servicing and engine installation work. This has changed. Jack is now an executive—an administrator with the marks of practical experience that assure others around a conference table that when he starts talking engines, drive units, fuels and lubricants it's a good time to sit back and listen. On tough problems—and a lot of them developed while Long Beach was jacking up its harbor and its oil installations to keep ahead of the Pacific—Jack Hughes still pulls on the overalls and becomes a master mechanic.

But 650 producing wells and nearly a hundred vehicles, plus all LBOD's oil field mechanical equipment, have made some new demands on the man who signed on as a service man 14 years ago. For one thing, with 49 men in his department he's something of a personnel administrator. The size and volume of their service operations has required use of some specialized servicing and engine-handling equipment and this has required special design work from Jack Hughes.

Departmentalizing and staying well ahead of his problems enables Jack Hughes to maintain an outward calm despite his responsibilities. Asked what happens to a well if one of his engines quits, he advises that it can "sand up", requiring that the whole pumping string and pump be pulled from the well.

But before mental arithmetic can estimate costs of such a breakdown, Jack adds that it's really not much of a problem because his engine shop keeps rebuilt engines in a "pool" for these difficulties. And if you ask him how he knows how many engines of different sizes to rebuild . . . how he knows how far he can go in the rebuilding before it becomes economically unjustified; . . . how he can schedule his rebuilding so his shop runs smoothly—Jack Hughes will shrug it away as being an elementary problem.

When It's Time To Buy, Jack Makes The Decision . . .

Purchasing—keeping ahead of his yearly requirements of 80,000 gallons of lube oil, 10,000 spark plugs plus hundreds of valves and scores of other expendable items—is another of Jack's big jobs.

With new products steadily hitting the market, Jack Hughes' responsibilities as the man behind the purchasing agent are sizeable. He isn't encumbered with paper work of the purchasing department, but he still has to make product determinations. This he does on his own and on the basis of his own knowledge of equipment needs.

In the case of the 500-hp natural gas engines used to power the water injection plants, Hughes was one of two men detailed to survey the field, study existing installations and come up with a decision. When hand tools for specialized operations come on the market, it's Jack Hughes who, in the last analysis, decides whether it's going to be in the interest of LBOD to purchase them.

"I've moved into this purchasing function rather naturally," observes Jack Hughes. "There's no way for the purchasing agent to evaluate new products or to determine how old ones stand up. So we've established machinery for purchasing items that are replaced again and again. But product evaluations? That's my job."

Jack Hughes has come a long way from the days when he once converted used Hudson auto engines to oil field use . . . a long way from servicing those 50 wells LBOD pumped when he first signed on. Yet, the very abilities that helped Jack Hughes see potential in use of the old Hudson Six have helped Long Beach Oil Development—and Jack Hughes—to grow and prosper, have helped save a sinking city!

Special field trucks fitted with heavy-duty batteries are used to start Bendix magneto-powered pump engines. Hot line, plugged into starter circuit, spins starter.

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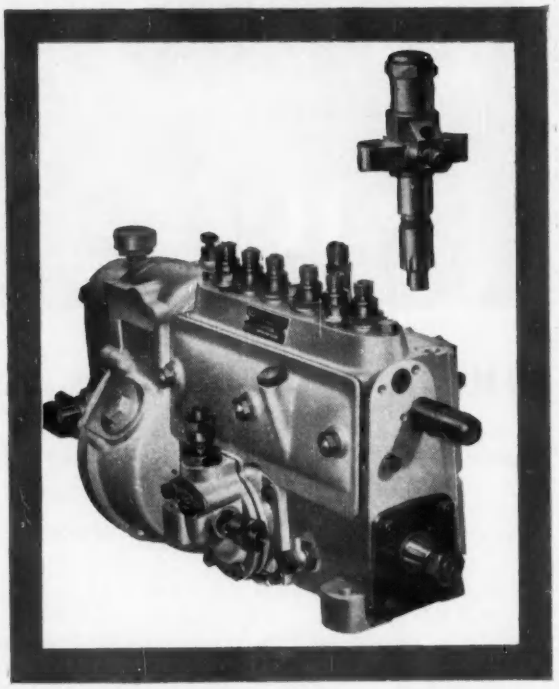

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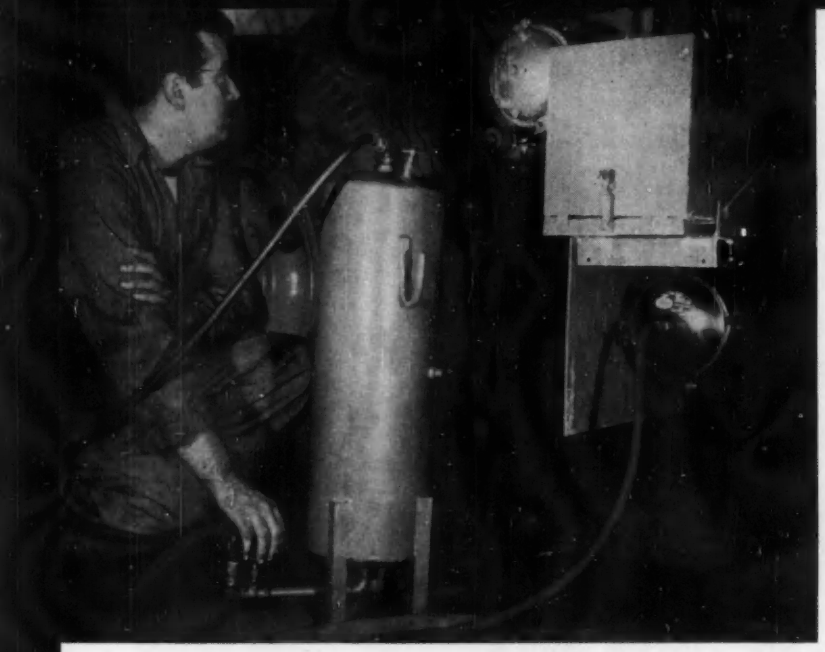
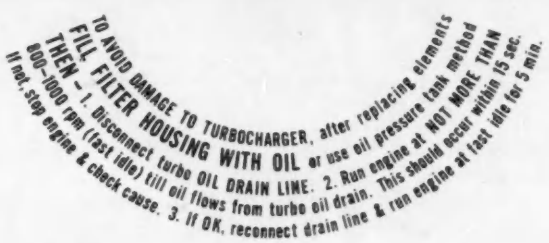


Outlet from pressure tank for filling crankcase is screwed into bleeder port on filter tank cover. Pressure forces oil up to turbo bearings. Decal (shown) serves as warning.

Prevent turbocharger troubles

story and photos by Paul B. Harder


TO AVOID DAMAGE TO TURBOCHARGER, after replacing elements
FILL FILTER HOUSING WITH OIL or use oil pressure tank method
THEN – 1. Disconnect turbo OIL DRAIN LINE. 2. Run engine at NOT MORE THAN
800–1000 rpm (fast idle) till oil flows from turbo oil drain. This should occur within 15 sec.
If not, stop engine & check cause. 3. If OK, reconnect drain line & run engine at fast idle for 5 min.

Careful lube changes . . . pyrometer . . . and avoiding hot stops avoid most turbocharger troubles.

"At least 80% of all truck turbocharger failures can be traced to careless lubrication techniques during oil changes. Another 15% results from damage done by 'hot stops' and the remainder from running the turbo too hot."

Ray Morgan, service manager for Mack Trucks, Inc. in Los Angeles speaks with authority in the field of turbocharger operation and service. With his shop foreman, W. E. Bedall, Ray spearheaded two distinct programs that are paying off in longer trouble-free turbocharger life.

"We found lubrication to be a probable source of trouble by timing the delay in getting oil through the turbocharger bearings following a normal oil and filter change," recalls Ray Morgan. 'On good, tight equipment, we were astonished to find a timelag of as much as 70 seconds!"

Morgan, backed up by the Schwitzer people, determined that five seconds was the absolute maximum that the engine could idle without full lubrication to the blower before the blower bearings became damaged. But the problem was actually worse than that.

"The normal practice of service men as well as drivers is to rev the engine after an oil change," states Morgan. "This has the effect of bringing oil pressure up a little quicker than normally. When you rev a turbocharged engine, however, blower rpm increases tremendously. This accelerated the damage to the blower bearings!"

Solution: Pressure Lube Changes . . .

Morgan and Bedall's solution to the problem: refill the drained crankcase by charging the entire oil lubrication system with oil under at least 90 lb of pressure. Properly done, this guarantees that air pockets in the system—including those in the filter tanks—have been squeezed out and that oil has reached the turbocharger bearings.

The job is performed by Mack's people—and a number of other operators, as well—by using a small pressure vessel with an air input line and an oil discharge line. The 5-gal pressure tank is filled with the proper amount of oil for the engine, the air line is snapped in place and the oil discharge line is screwed into the bleeder tap on the lower filter tank.

After the discharge line from the turbocharger is disconnected, the valve on the air line is cracked. Oil floods the new filter elements and pushes through the system. When it's running freely from the turbocharger discharge, the discharge line is connected and the balance of the oil in the pressure vessel is run through the system and into the crankcase.

"This practice has practically eliminated turbocharger troubles for those operators who use it. We've had decals made which are placed on our filter tank covers. They describe this technique and the alternate method of filling the filter housing with oil if the pressure tanks are not available."

When She's Hot, Let'er Cool Gradually!!

Another source of danger for the turbo is when the driver shuts down his engine while it's still very hot.

"Let's suppose you come into a truck stop after a

long, high-speed pull," Morgan explained. "Temperatures inside your engine (and the water temperature gauge won't show this) are at or very near maximum —in the cylinders, piston heads, valves and the turbo wheel. Out on the road, these temperatures have been held within allowable limits by your cooling system's circulation and high air-flow through the engine. Now, if you shut down that hot engine, both air and water-cooling stop—and you begin running into dangers of afterboil of water in the jackets, warped valves . . . and turbo troubles!"

Rapid and uneven cooling of a very hot turbocharger weakens and loosens the housing studs—can cause a distortion of shaft and blades. Morgan says that troubles usually show up initially in fumes and leaks, turbo inefficiency and, eventually, bearing failure.

Schwitzer and Mack recommended that when you roll into the truck stop hot, be patient. Just a few minutes of idling while she cools gradually, pays off!

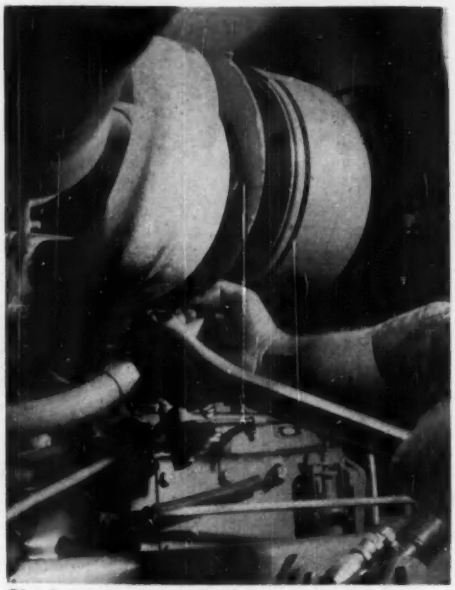
Pyrometer Is Gauge To Watch!

Still another source of danger for your turbo is found out on the highway. Drivers can find themselves in an overfueling situation if their truck starts lugging . . . if its injection pump settings are too high . . . when an air filter is becoming clogged.

Starving for air, your engine is soon into overfueling—and this can cause dangerously high exhaust temperatures which can damage that turbocharger if it isn't caught quickly.

A pyrometer's thermocouple installed near the turbo inlet will tell when these conditions exist. Recently, Alnor designed a pyrometer specifically for this purpose and they have been very effective wherever such installations have been made and followed-up by driver education.

Mack has the dials calibrated into "red" and "green" sections, or, in other applications, a standard temperature scale can be "red-lined" at the critical temperature. Noting the pyrometer needle in the "red" or above the red-line tells the driver to ease up on his throttle, downshift, or in extreme cases pull over and let his engine idle until the pyrometer pointer falls back into the safe zone.

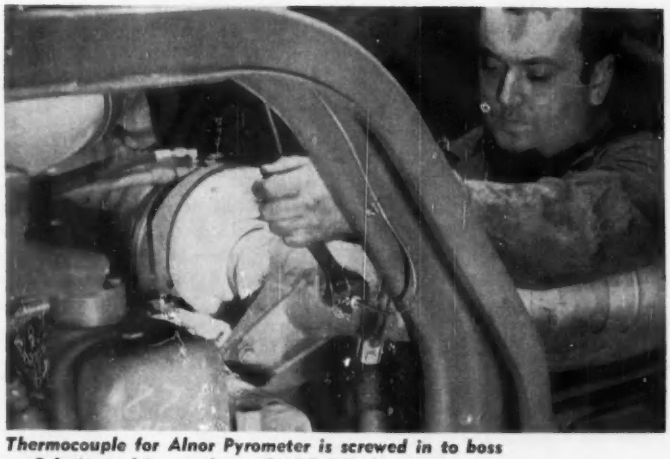


Check pressure at turbo bearings by disconnecting lines below turbo, watching for flow. Don't forget to re-tighten.

Incidentally, check of pyrometer readings will show difference in exhaust temperature at idle and at load, showing reduction of heat in system and why parts cool at idle.

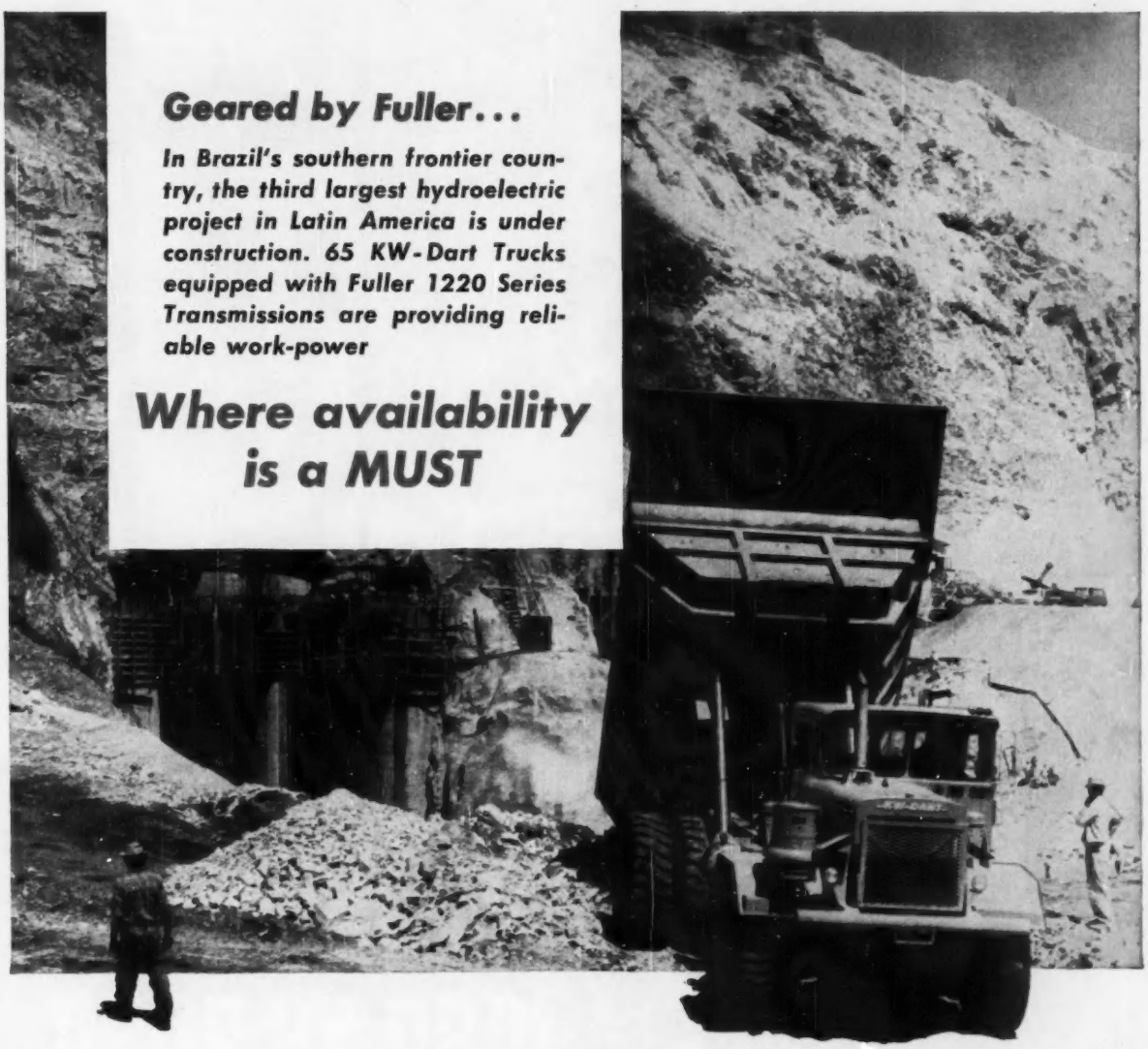
80% . . . 15% . . . 5% . . .

Ray Morgan has put his finger on procedures that can all but eliminate turbo troubles. Careful lube oil change procedures eliminate premature bearing failure . . . driver education to change the habit of shutting off hot engines . . . and using that new instrument up on the dash, Alnor's pyrometer, is protecting the turbo out on the highway, lengthening engine life and cutting maintenance time on both the engine and its turbo.



Thermocouple for Alnor Pyrometer is screwed in to boss on Schwitzer 4-ins. turbo on EMDT 763 Mack diesel.

Alnor Pyrometer is dash-mounted. On Macks, dial is color coded for fast reading.



Geared by Fuller...

In Brazil's southern frontier country, the third largest hydroelectric project in Latin America is under construction. 65 KW-Dart Trucks equipped with Fuller 1220 Series Transmissions are providing reliable work-power

Where availability is a MUST

To harness much of Brazil's tremendous water power potential, Central Eletrica de Furnas is building a 400-foot-high dam across the Rio Grande River. Completion date for the dam, which will create a reservoir 150 miles long, was originally set for 1965, but an earlier finish is now in sight.

Contributing greatly to the accelerated construction schedule are 65 Fuller-geared KW-Dart Trucks used on the project. 55 of the KW-Darts are Model 25SL, 25-ton dump trucks equipped with 320 hp diesel engines and Fuller 10-F-1220 10-speed Transmissions. The remaining ten are heavy-duty KW-Dart Diesel Tractors, seven of which are equipped with 10-F-1220s and the other three with Fuller 5-F-1220 5-speed Transmissions. The tractors are used to transport cement and move heavy equipment.

Working more than 6,000 miles from Kansas City, Mo., where they were built, the trucks were selected because of the dependability of their component parts. Reports from the project site indicate that the heavy-duty Fuller Transmissions in the mountain-moving fleet have been instrumental in the trucks' excellent record of performance and availability on one of the world's most dramatic construction jobs.

Ask about the Fuller Transmission designed for *your* operation.

FULLER TRANSMISSION DIVISION

EATON MANUFACTURING COMPANY

KALAMAZOO, MICHIGAN

Sales & Service: West. Dist. Branch, Oakland 6, Cal. • Southwest Dist. Office, Tulsa 3, Okla. • Automotive Products Co., Ltd., Brock House, Langham St., London W.1, England, European Rep.

For more information write in No. 476

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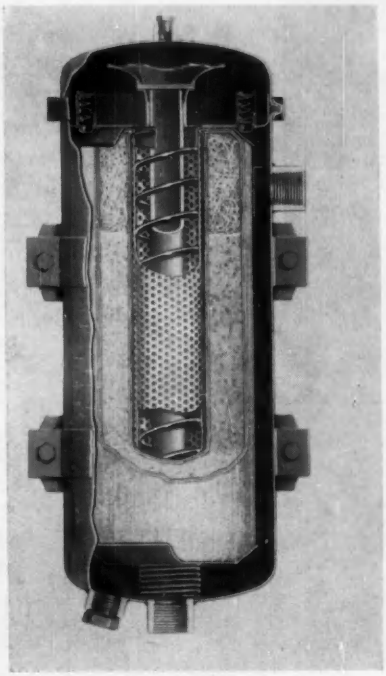
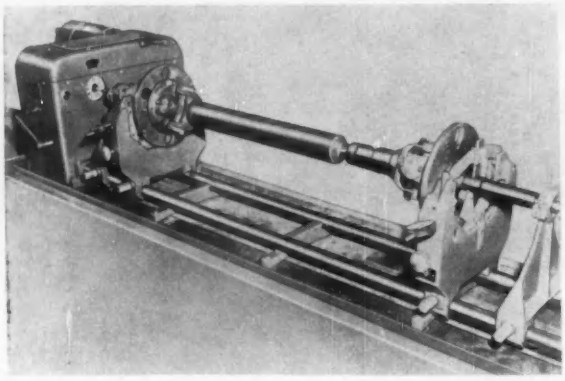
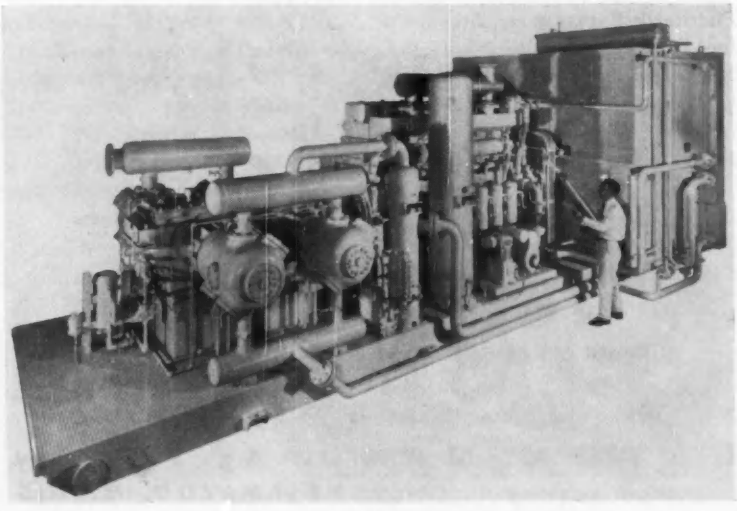


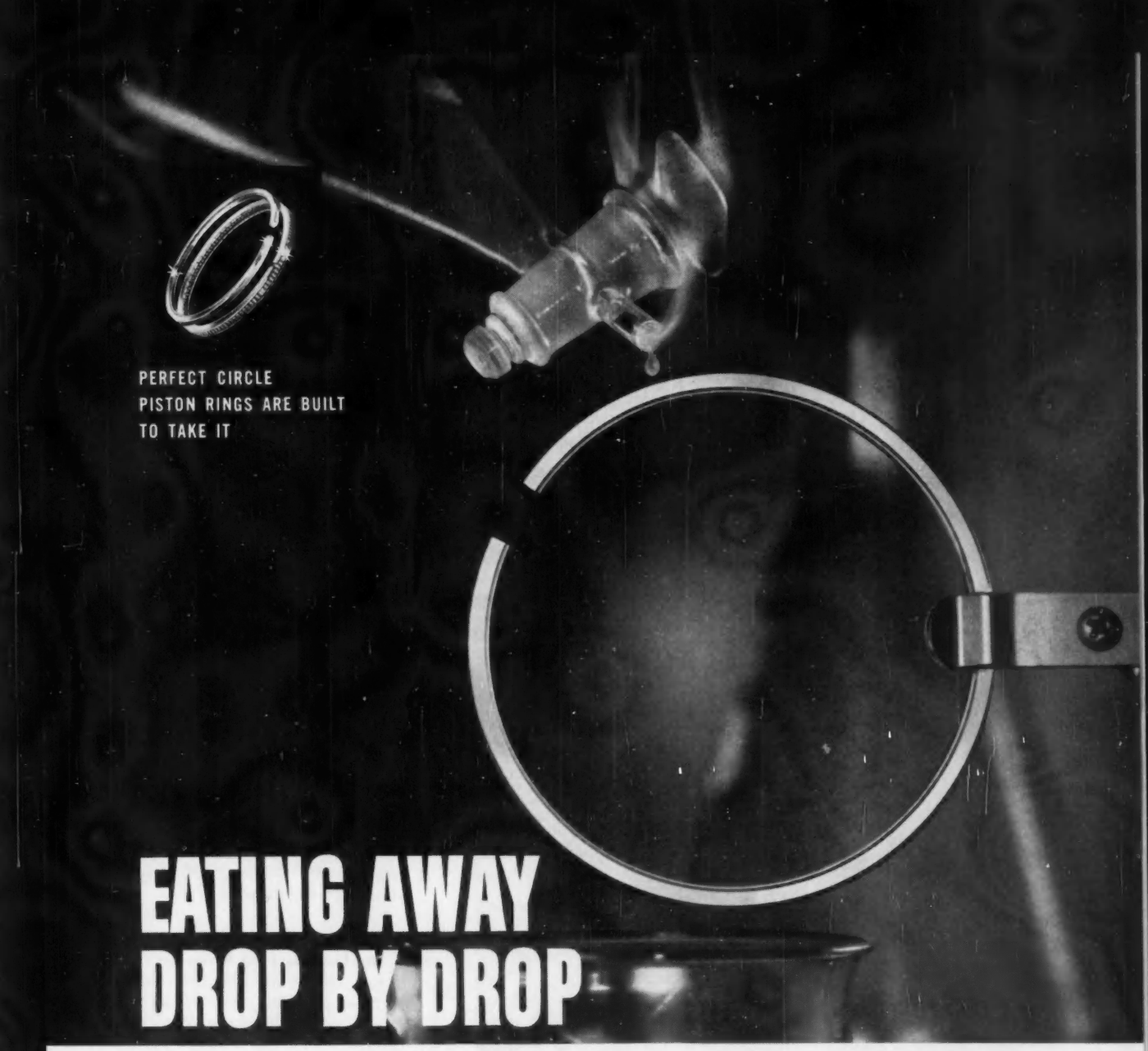
Winslow Improves Filter Element
A large single-element full-flow cartridge will replace Winslow's multi-element type. The new element is based on a principle of having two flow rates in the one element. It requires only one inlet and one outlet, and provides true full-flow rather than dual-purpose with by-pass. Introduction of the newly-designed element is to provide efficient oil filtration at a lower maintenance cost by reducing installation time. **495**



Dynamic Balancer for Long-Life Rebuild
Bear Manufacturing's B & RV balancer is designed to dynamically balance any rotating part or assembly including cranks, flywheels and drive shafts. Spindle speeds range from 425 to 4250 rpm. Weight range for assemblies is 3-300 pounds. Maximum accepted length is 90 inches. Other special-requirement balancing machines can be built to order. Purpose of balancing: smoothness, and to increase engine life by as much as 25%. **496**

Matched Engine-Compressor
White Diesel Engine Division is producing a line of medium-speed balanced opposed compressors for gas gathering, lifting, repressuring and booster service. Two and four cylinder compressors are designed for continuous unattended heavy-duty service in direct-drive with White Superior natural-gas engines. Matched units are available from 200 to 1000 hp, naturally-aspirated or turbocharged. Complication is reduced by direct drive at engine speed, compact compressors, relatively-low piston speed and gas velocities. **497**





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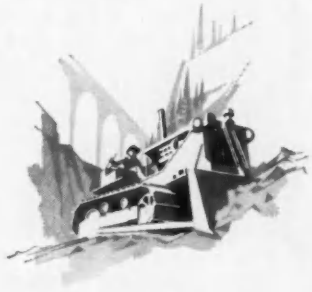
Moisture and acids formed by combustion can eat away piston rings, much as they eat away mufflers and tailpipes.

Perfect Circle protects against this corrosive wear with extra-thick, solid chrome plating. For abnormally corrosive applications, special alloys are also used. And, Perfect Circle rings are even specially protected from corrosive skin acids during production, packing and installation.

Perfect Circle rings are built to take the toughest engine wear. Insist on Perfect Circles—the most preferred piston rings in all the world.



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PISTON RINGS • PRECISION CASTINGS • POWER SERVICE PRODUCTS • SPEEDOSTAT

HAGERSTOWN, INDIANA • DON MILLS, ONTARIO, CANADA

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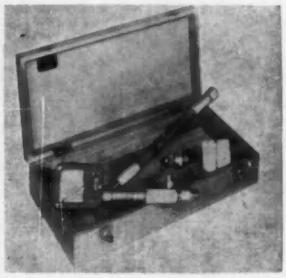
New MotoMeter Writes Its Own Story!

A new MotoMeter Recording Compressor Tester imported to the United States exclusively by A. R. Fisher Products Corp. indicates compression while it automatically records the reading on a permanent chart.

Made in Stuttgart, Germany, it is a valuable new tool for fleet diesel truck operators, industrial users, marine and stationary engine, service shops and wherever Diesel engines are maintained.

You get a permanent record for your files showing engine condition. Readings up to 570 lbs . . . beautifully packaged in a hardwood chest complete with flexible high pressure hose, couplings, and a generous supply of Recording Charts. Adaptors for every type of Diesel engine are also available for engines not using glow plugs.



It's value-plus at $39.50 mechanics net. Portable, too! **498**

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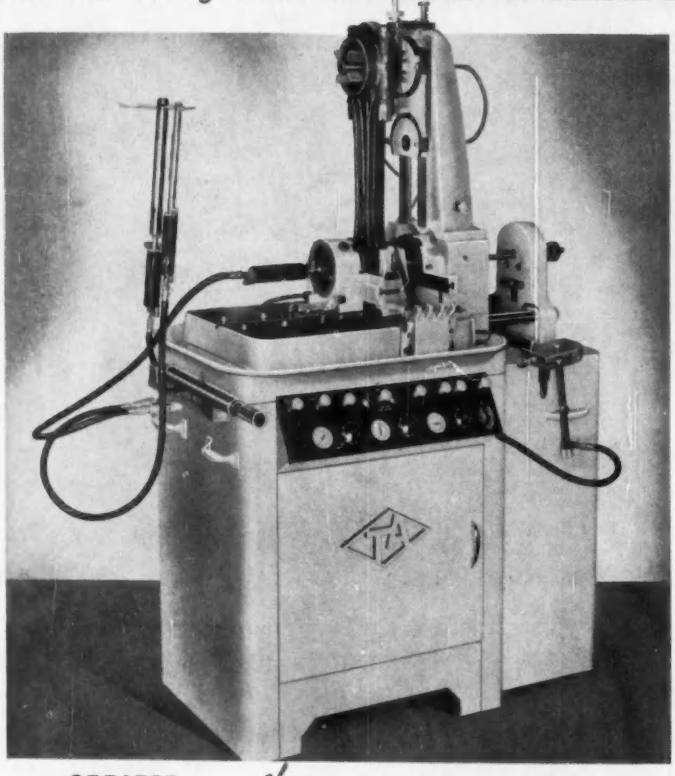

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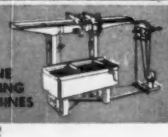
LINE BORING MACHINES

For more information write in No. 478

It's New . . . for Clutches

A new concept in an air clutch and brake has been designed by Mid-States Industrial Clutch Co.

The Power Flo Air Friction clutch embodies new design and material features that make possible greater torque capacity, high temperature applications, better heat dissipation and less maintenance.

Two compact sizes, 16-in. and 18-in. with torque capacities of 32,500 and 52,200-in. lbs at 80 psi, respectively, suggest practical application for diesel units. **499**

Cat's New Filter Element . . . a Double-Barreled Winner

Full service life and the removal of more impurities . . . That's Caterpillar's new lubrication oil filter element, 7M 3800. Replacing 9F 6700, the costs are the same. So are the appearance and dimensions. But, the story's in the filtering paper. Stronger, thicker, "deep grooving" to maintain proper fold separation.

Use it in all track-type tractor and Traxcavator models and motor graders except the D9 manufactured by Cat in the torque converter, transmission, brake and steering, or crankcase lubrication systems, as well as in these component systems of the No. 583 and No. 572 Pipelayer models.

Use it in all of Cat's Diesel Engines, too, except the D353, D337 and D326. **500**

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"Custom" Transmissions . . .

(Continued from page 27)

load you expect to have . . . number of speeds required . . . type of shift and type of service you'll be operating in (standby, intermittent, continuous, stationary, mobile off-on highway use). It's also necessary for the customizer to have information on your particular installation requirements . . . output shaft specifications . . . as well as clutch details. From here on Cotta's experienced engineers take over, customizing you a tailor-made transmission.

Case History Proves Point . . .

Let's take a typical case, one that is growing in popularity, a specialized truck for aircraft servicing. There are several types of these trucks but they have one thing in common—multiple-purpose use of the diesel engine. Jet fueling is one type. Here we need a heavy-duty drive line to the wheels for a GVW of 60,000 to 70,000 lb. Once spotted, the truck's engine pumps fuel. This involves a transfer case and PTO to provide the necessary power at right rotation and speed to the pump. Disconnect features are also included.

Another type of service truck is used for washing and de-icing aircraft with other jobs thrown in. This means multiple PTO's with disconnect features as well as the other equipment. In all of this type of equipment there is never any extra space, simplicity is important as the operators are not professional truck drivers and reliability is of utmost importance.

Here's a job for custom equipment where the quantities involved are low. In short, the type of thing in which Cotta specializes. One . . . ten . . . or 100, they're set up to do the job.

Experience Is The Payoff . . .

How come? They "think" in terms of customizing, short production runs being inherent. Build enough special units and engineering is reduced largely to use of parameters with concentration only on major special requirements. Patterns for housing castings can be used "as is" or modified slightly. For a single really "off-beat" unit, fabrication may solve the housing problem.

"Helical gears are used throughout and their hobbing machines can turn out gears at standard ratios or special ones in short order. Tooling is set up to produce shafting with the desired tapers, splines, keyways, or whatever, to meet the need. Material selection, and proper heat treatment is based on modern technology backed up by experience factors.

Their shifting clutches are of standard proven design, if necessary adapted to specific requirements. Bearing speed and load are carefully pre-determined and materials selected with this in mind. *Thinking* customizing is paying off—for both equipment manufacturer and user!

Minipump . . .

(Continued from page 23)

the plunger return springs and bottom spring seats can be left off and the pump body temporarily attached. Using the flow method and a degree wheel, timing adjustment can be made quickly and positively.

Establishing proper clearance between plunger arm and the bottom spring plate, indicated by vertical float, is also done before final fitting of the upper casing or pump body.

Calibration and balancing of delivery is easy. On final assembly the control mechanism is installed. Plunger arms engage control forks on the control rod actuated by the governor. These control forks can be loosened and moved appropriately on the rod. The clamp screws are right in front when the inspection cover is off.

This arrangement, plus the long plunger arms, make adjustment both more convenient and accurate than is the case with the conventional rack and pinion control. The control forks are right in front for convenient positioning and clamping screws are readily accessible for positive tightening. Any slight play between the arms and control forks is no more than the normal backlash between a rack and pinion. Also, this play is minimized since it is at a long radius from the plunger axis. This long radius also helps accuracy of setting.

Options to fit the application . . . .

Engine builders will, of course, select the proper plunger size to supply the maximum required fuel per cylinder. They also have the option of flange or base mounting of the pump.

In variable speed and load applications such as on vehicles, a simple vacuum governor is sufficient. These have the advantages of being light, compact and relatively inexpensive.

Where closer speed regulation is required, a more sophisticated centrifugal-type mechanical governor is applied. This governor as well as the vacuum type have an integral maximum fuel stop and an excess fuel device.

This excess fuel device can also be made "cheat-proof." Many such are installed as standard equipment on British vehicles. This internal device provides up to 100% excess fuel needed for starting but once the vehicle is moving it automatically holds fuel delivery to the desired maximum. This prevents the driver from over-fueling and getting into the engine's smoke range.

A fuel transfer pump of the diaphragm type is used. This is very similar to those used on automotive gasoline engines. It is a die casting and relatively simple, both being cost factors. A lever is attached for diaphragm operation when hand-priming is needed.

Another Simms product, their CR coupling line, is useful for pump drive. Torque is transmitted through a special rubber element and while the unit is stiff enough not to affect pump timing and smoothness of drive, it does compensate for some minor misalignment and dampens torsional vibration. A vernier arrangement is provided for accurate timing adjustment.

diesel power

new literature

Oakite Bulletin Considers Rust Removal

Rust . . . how to remove it . . . how to prevent it, is the subject of Oakite's Service Bulletin, No. 16B. This is the know-how that will save industry millions of dollars.

The material covers such common industrial problems as the safe removal of rust from raw stock by the use of inhibitors or inhibited acid compounds; prevention of hydrogen embrittlement during rust removal by the use of alkaline de-rusting agents, conditioning surfaces for painting, rust prevention between processing operations and during storage periods, etc. Don't let yourself go "rusty" on this vital subject . . . keep posted through Oakite!

501

How About Safety *Plus* Economy?

". . . convert the control of runaway energy into greater profits . . ." with the Hydrotarder. To that end, the Parkersburg Rig & Reel Co. invites you to read all about it in their new and profusely illustrated 2-color brochure.

According to the manufacturer, hundreds of industries have enjoyed huge maintenance savings with greater safety by installing the versatile Hydrotarder. Smooth, regulated speed control independent of the regular brakes is possible whenever there's a heavy load and a steep descent.

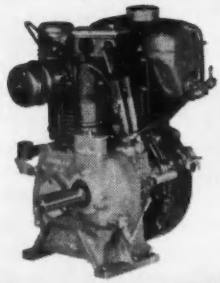
Trucks and tractors, on and off the highway, heavy loads including dangerous cargo such as gasoline, chemicals, and explosives, oil field drilling operations, hoisting, mining, rails and even in the testing labs . . . versatility unlimited!

502

BIG JOB...SMALL ENGINE?

YANMAR

DIESEL DOES IT!



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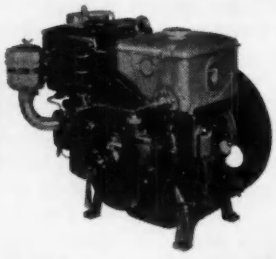

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Government Surplus, BRAND NEW, In factory packages. List Price $125.00. Provides positive protection against high water jacket temperature and low lubricating oil pressure. Adjustable temperature cut-off range 180-210 degrees; max. oil pressure 75 lbs.; adjustable cut-off range 2-25 PSI. Automatically shuts off engine fuel oil supply and drains fuel line between shut-off valve and injection pump. Supplied with 6' long tubing to temperature bulb. 11" h., 6" w., 2¾" deep. Shpg. wt. 12 lbs. FOB Chicago.

No. AN863 Our price $55.00

(Quantity price 3 for $150.00)

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For more information write in No. 490

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Taking Up the Slack!

Power failure's no problem with a new Motor-Generator by Kato that provides plenty of momentum until the diesel takes over again!

A new large fly-wheel featured on the generator is designed to hold slowdown to a minimum.

This Kato motor-generator set, with a brushless type generator and direct-connected separate exciter, is rated at 5 KW, 6.25 KVA, .8 factor, 120 volts AC, one phase, 50 cps. A Kato mag. amp regulator provides 1½% of rated voltage under ¼ load to full load conditions. Rectifier assembly is mounted on end of shaft for easy replacement of rectifiers.

Motor is 10 hp, 208/416 Volts AC, 1,500 RPM, 50 Cycles, 3 phase, wound rotor induction type.

503

Learn About Lapmasters

The Lapmaster Division of Crane Packing can fill you in on the details that will open your eyes to the importance of the Lapmaster in the diesel repair field. With a Lapmaster, for instance, you can return diesel parts to the same precision flatness, finish and parallelity as originally built into them by their manufacturer.

The Lapmaster is used by most diesel equipment manufacturers for perfect mating services for high pressure sealing, part after part.

Take a look at Lapmaster's latest catalogs for information that'll save you time, labor and money.

506

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Pacific DIESEL Parts Co.
(A Corporation)
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Mail Address—P.O. Box 1087
LUdlow 1-6082

For more information write in No. 483

Use your dp Reader Service Card.

When the Going is Rough . . .

. . . Use two new DC diesel welders from the Airco Co. International, a division of Air Reduction Company. They're just right for field welding, when the going is rough.

One, the "Yellow Jacket" welder, has been designed in 300 and 400 ampere rated sizes and powered by a 4-cyl injection type diesel engine for pipelines and other heavy duty construction jobs. Features . . . steady welding current, quick response to arc starts, controlled current peaks, high recovery voltage.

Use of diesel fuel eliminates fire hazards, for the most part, complying with safety regulations on many jobs such as off-shore oil drilling rigs, tunnels, mines and on shipboard wherever gasoline is prohibited. Use of diesel fuel also reduces losses from pilferage.

507

Here's An "Encyclopedia" from United Electric Controls

A General Catalog, No. 52 on Electric Temperature and Pressure Controls published by the United Electric Controls Co. enumerates the line and all its applications. The 3-color carefully bound book features thumb-indexed sections for ready reference.

Section by section, too, you'll see specifications, illustrations, charts, variations, applications and ordering advice. Included are local-mounted immersion thermostats, remote-bulb thermostats, and indicating-temperature, pressure-vacuum and differential pressure-vacuum controls.

United caters to marine, industrial and aircraft users, among many others!

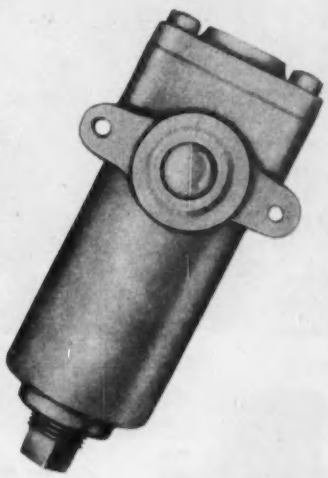
508

Deutz "digs" Diesels!

Deutz has been solving diesel problems for over 90 years! Front-end loaders, compactors, marine vessels, power plants, generators or ore carriers. Air and water cooled diesels. Rugged and reliable. Send for the booklets designed and published to meet your problems! Marine, mining, construction, power, irrigation, or oil pipe line.

509

Save time, trouble!
Determine cause of engine shut-down with
Amot Model 2400 Indicating Relay



Amot Model 2400 Indicating Relay tells which engine hazard caused shut-down, (whether low oil pressure, high water temperature or what).
Uses air or gas pressure to function. One Relay used for each safety component in system.

If condition is dangerous, Relay will act to vent Safety Control and shut down engine. Quick check of indicator shows cause of shut-down. Each Relay automatically resets itself when engine is again started. Can be easily installed on existing engines. For information on components, controls or systems, ask for Bulletin Q-5.3.

Amot controls CORPORATION
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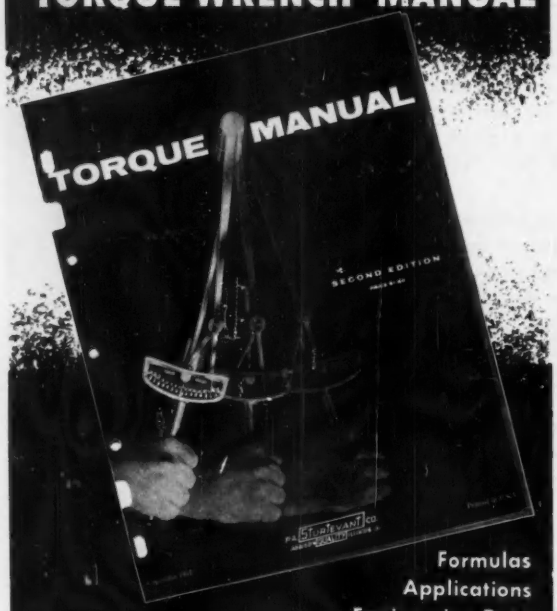

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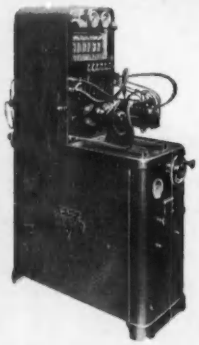

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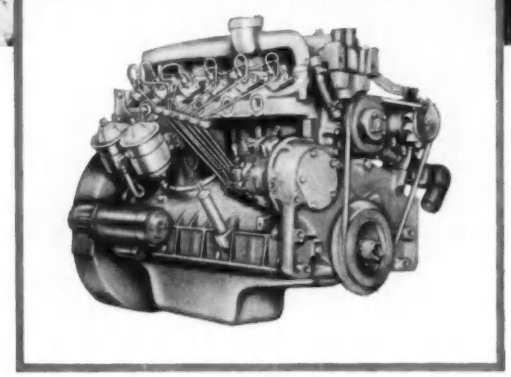

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